AMERICAN
JOURNAL OF SURGERY

VOL. XXVII. FEBRUARY, 1913. No. 2.

PRESERVING THE SPHINCTER IN THE TREATMENT OF FISSURE AND FISTULA IN ANO.*

G. A. HUMPHREYS, M.D.,

Attending Surgeon, Northwestern Dispensary; Attending Surgeon, St. Bartholomew's Clinic and Hospital; Assistant Surgeon, N. Y. Polyclinic Hospital.

NEW YORK.

FISSURE IN ANO.

The usual exciting cause is the passage of large, hard and rough fecal masses. The predisposing cause may be an increase in the connective tissue cells—the result of congestion that regularly goes with piles, and piles are frequently present in fissure cases.

Tuttle says that hemorrhoids, by narrowing the outlet and by producing changes in the connective tissue of the parts, favor the development of fissure. Ball thinks that the typical fissures are caused by the tearing of the crypts of Morgagni by small fecal masses becoming lodged in the pockets, while large fecal masses going by press on the edges of the valves and the small masses in the pockets, thus tearing the edge of the valve and starting the fissure which extends downward with repeated tearings.

This does not explain the usual location of a fissure—in the posterior commissure in men, and in the posterior or anterior commissure in women, and rarely on the sides in either male or female. It seems to me more reasonable to attribute the tearing of the mucous membrane in the posterior commissure and in the anterior commissure, when the anal canal is being traversed by a large, tightly fitting mass, to natural defects in the anal canal. The anal canal answers admirably for the escape of a normal movement but was never intended for the easy escape of such masses as some people allow to form in the rectum before evacuation.

The upper limit of the anal canal is surrounded by the internal sphincter, whose fibers are circular and support the mucous membrane at all points in its circumference equally. At the lower end of the anal canal is the external sphincter; its most superficial fibers are circular, and these support the mucous membrane equally at all points when it is being unnaturally distended. The main fibers of the external sphincter, just above the circular fibers, are not circular; they approach the posterior edge of the anus as parallel fibers, but when near the posterior commissure, they diverge—one-half going on one side and the other half going on the other side of the anus—and apply themselves more closely to the wall of the gut at the side of the anus and so continue until the anterior commissure is reached where many of its fibers again resume a parallel course to be inserted into the perineal body. This arrangement of the fibers leaves a triangular space of non-support, relatively speaking, extending from the superficial circular fibers of the external sphincter below to the internal sphincter above. In the male the muscular fibers come together more abruptly in front than behind to be inserted into the perineal body which is not so far away from the anus as is the coccyx from the posterior edge of the anus. Also, in the male there is a very compact perineal body to support the mucous membrane in front. In the female there is an absence of the firm perineum in front of the anus, and much of this natural support is removed by perineal tears. In support of this view I would state that I have seen many more anterior fissures in women with torn perinei than in women with perinei intact.

One thing that I would emphasize is the marked interval between the sphincters and the very perceptible depression between them, giving one the impression of the existence of an anal cavity, whereas all the casts of the rectum and anus, made by distending the rectum and anus of the cadaver with plaster of Paris and paraffin, show an anal canal of almost uniform caliber. To demonstrate the true shape of the anal canal in life I have attempted to get a cast of this cavity in the living subject, and have in a measure succeeded. The method of making this cast was as follows: Plaster of Paris was mixed with water and poured into a large or medium-sized finger cot made of thinnest rubber. The end of the cot was tied and passed, thus filled, through a short proctoscope until the distal end rested just above the internal sphincter. The cot was held there with long dressing forceps while the

* Read before the Bellevue Hospital Alumni Society, December 4, 1912.

proctoscope was withdrawn. The cot was allowed to so remain with the lower end protruding from the anus until the plaster had hardened; it was then removed by allowing the patient to pass it in a bucket partly filled with water, or by using gentle traction while the patient bears down. I found that if the plaster was very fluid when introduced, practically all of it hardened in two masses—one above the internal sphincter and the other outside the anus. If the plaster was very thick when inserted, the sphincters would merely indent it to a variable degree depending on the consistency of the plaster, thus marking off three nodules—a larger one above and below the sphincters, and a smaller one corresponding to the interval between the sphincters. The indentation caused by the internal sphincter was regularly deeper than that caused by the external sphincter. I found it quite difficult to catch the plaster of just the proper consistency to allow the sphincter to barely cut through and thus give the desired cast. After many attempts I succeeded in getting one fairly satisfactory cast. Its dimensions were ¾ inches long and ⅜ inches in diameter; it crumbled easily at both ends and lost its original shape. I am therefore able to show here two casts only partially satisfactory, but sufficiently so to point to the existence of an anal cavity or pouch which completely collapses when empty but which may contain fecal matter, if the bowels are not perfectly evacuated, or pus in some pathological conditions. (Figure V.) I would call attention to the greater power of the internal sphincter as shown by the deeper indentation caused by it, in the cast. No plaster remaining between the sphincters when introduced very fluid shows that the anal pouch completely collapses under normal conditions.

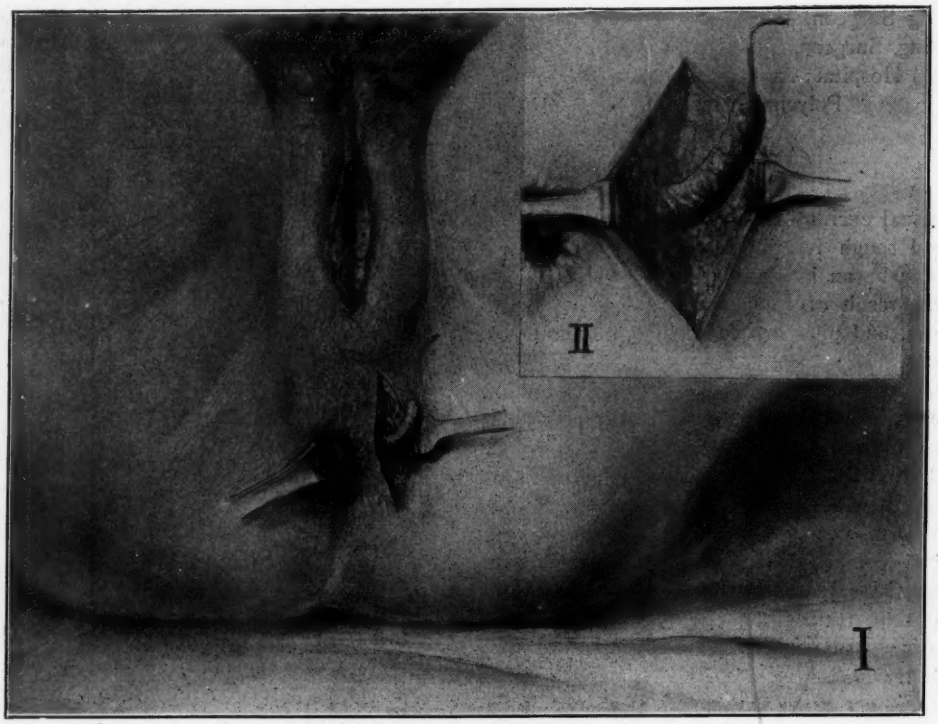

Figure 1 and Figure 2.

At times, on examining cases with a history of fissure, I have noticed that in tearing open the anus several drops of pus would escape and in such cases I have often withheld final judgment as to the exact nature of the lesion until operation, fearing that in addition to fissure there might also be a fistula. I have operated upon some such cases without finding fistula and have concluded that the pus had been stored in the anal pouch or cavity because of the tight internal sphincter above and the tight external sphincter below.

With such a condition the treatment would seem to be drainage and it occurred that drainage was all that was necessary in the treatment of any fissure—even though an accumulation of purulent discharge could not be demonstrated in more than the exceptional case.

If the fissure is of recent origin and the edges are not thickened and if the sphincter is not markedly hypertrophied, the case may be successfully managed by proper regulation of the bowels and by daily local applications, first using cocaine or anesthesine to allay the pain and then pure ichthyol or other stimulating application. If in about three weeks a cure is not effected, some more radical step should be taken. There is no possibility of damaging the sphincter by local treatment, but there is danger in persisting too long in the effort to effect a cure. As long as the fissure is present there is danger of infection traveling to the deeper tissues and producing an abscess and later a fistula. There are some patients who will submit to nothing but local treatment and they should be informed of the dangers of allowing an ulcer to remain in the anal canal.

Dilatation of the sphincter is the method most generally resorted to by the general practitioner. The greater number no doubt are cured by this method, but many cases recur. By this treatment the power of the sphincter is suspended temporarily. It gradually returns and is restored almost completely in seventy-two hours, where there has not been actual tearing of the muscular fibers. During this period of suspended activity of the sphincter muscle there is an absence of pressure and infolding of the edges of the mucous membrane in the ulcer. Shall we attribute the cure solely to absence of pressure and infolding of the edges of the ulcer, or is the drainage thus secured an essential element in the cures effected by this treatment?

For years it has seemed to me that drainage was the great desideratum in the treatment of fissure and I have come to the belief that the incision that drains the ulcer most perfectly is the one that will most uniformly produce a cure.

About fifteen months ago I began to treat a few cases with mechanical apparatus devised primarily to drain the fissure or ulcer in the anal canal without cutting the sphincters and without forcible dilatation. The apparatus first used was a piece of rubber tubing 9-16 in. in diameter and five or six inches long. Numerous small perforations were made on one end of this tube and this end was secured in an elliptical opening made near the center of a half of a hollow rubber ball two and a half inches in diameter, so that the entire tube projected from the convex surface of the hollow rubber hemisphere. The hollow hemisphere was calculated to hold the tube in the rectum and the perforations in the tube were for drainage. The tube was of smooth finish and the half-rubber ball of such thickness that it could be folded up and passed into the rectum with sponge forceps where it could be released. (Figure VI.) This tube was inserted in the first patient and a large safety pin was passed through the outer end of the tube to prevent its being driven into the rectum. The patient had previously been given a cathartic. The tube was kept in with more or less discomfort for five days. He was able to walk home but complained of discomfort and could not sleep well. He was able to come to me three times at the dispensary and I had to see him twice at his home. He found that his

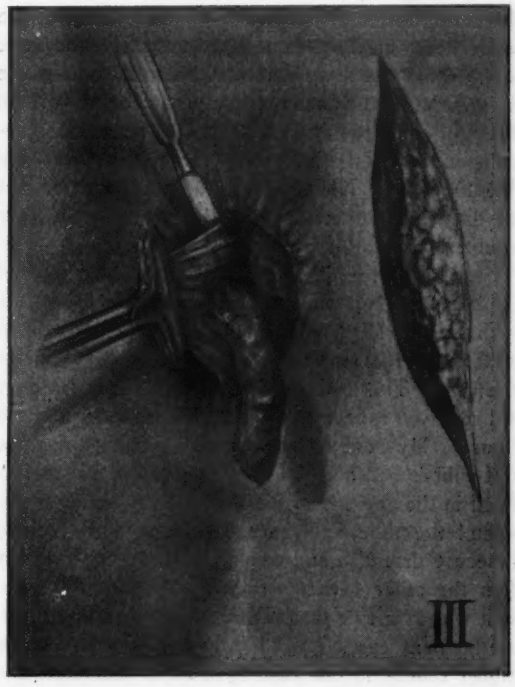

Figure 3.

position of greatest comfort was stooping over when standing or with thighs flexed on abdomen if lying in bed. Each day I irrigated the rectum through the tube with about one pint of normal salt solution, injecting a small portion at a time and allowing it to return. The idea was to produce cleanliness and not to secure a movement from the bowels, though small particles of fecal matter did return through the tube; on the fifth day he complained of actual pain and on examination I noticed that the mucous membrane was actually forced through the little openings in the rubber tube, producing little teat-like projections. It seemed that the point of toleration was reached, so I removed the tube, doubting very much whether the fissure would be benefited. This patient was, however,

perfectly cured, and there has been no trouble during the past fifteen months. There was marked spasm of the sphincter most of the time that the tube was in place, so the ulcer could not have been benefited much by lessened pressure, but drainage was secured.

The marked discomfort and tendency of the mucous membrane to protrude through the perforations led me to make some modifications in the later apparatus. I next used a half of a rubber ball 1⅞ in. in diameter and made the opening more elliptical and nearer one edge and attached the tube in this opening only at the sides so that the tube could move forward and backward without carrying the ball. I also used the same sized tube with the same perforations but sewed around this tube some gauze to prevent the mucous membrane being driven through. (Figure VI.) This could be worn somewhat more comfortably but the patient was not able to work. The tube was kept in position for six days and when removed there was no further trouble from the fissure.

Because of the discomfort I next used a half of a rubber ball 1⅞ in. in diameter and the tube ⅜ in. in diameter and fastened to two pieces of a small catheter in the rear of the large tube to facilitate drainage. This I was able to keep in only six days and removed it because of discomfort, but I secured a cure. My next endeavor was by using the same half-rubber ball and tube with a piece of gauze fastened in the opening in the ball and projecting down behind the tube. (Figure VII, a.) This seemed to secure drainage and was worn more comfortably than the other forms previously tried, but the patient was as a rule uncomfortable on standing erect. In the next cases I used only a straight piece of rubber tubing, in one case 9/16 in. in diameter, and in the other ⅜ in. in diameter, with a piece of gauze fastened to the upper end and extending down behind the tube. (Figure VII, c.) In these cases I did not depend on the rubber hemisphere above to support the tube, but placed a large safety pin through the outer end of the tube, placed gauze around the outer end of the tube and held it in position by strapping the buttocks together with adhesive straps. Two cases were cured with this style of tube—one after six days and one after eight days. The patients were perfectly comfortable wearing these tubes when lying down. One patient in whom I placed such a tube never returned. I had a few cases where I attempted to introduce the first style of apparatus and had to abandon it because of pain. I was able to introduce the plain tube and strip of gauze in the three cases where I attempted it. This I would try in every case refusing an operation, particularly if the patient can remain in bed a few days.

It would thus appear that drainage and rest were all that was necessary to secure a cure of ordinary fissure in ano. Here the word rest carries with it the idea of immobilization of a sphincter still retaining its power.

The cases, however, in which this method has been used are too few to make me as certain of a cure as by the proper incision, so I most frequently employ incision. With the incision, after one or two days, there is practically no discomfort and we are practically assured of a cure, and there is no more pain from the operation under cocaine properly distributed than from the introduction of the tube. The drainage method will be accepted, however, by some patients who will not submit to any cutting operation.

This method seems to me to demonstrate the fact that drainage is the all-important factor in the treatment of fissure, for the tube used was of small diameter and no forcible dilatation and no incision were employed in any of these six cases. I was careful, however, not to employ this method in any case that looked tuberculous.

Where treating by incision, my only aim is to secure good drainage of the space between the sphincters. If the fissure is in the posterior commissure the sentinel pile is removed from below, if there be such, and any polypoid growth is removed from above, if there be such projecting into the fissure, and the edges of the ulcer are trimmed off if they be thickened; then an incision is made extending from the deepest part of the sulcus between the sphincters, posteriorly, downward and backward to no greater depth from the skin than at the upper end of the incision but extending backward an inch or more, the incision gradually lessening in depth. If the fissure is in the anterior commissure or on either side, the thickened edges are trimmed away, the sentinel pile and polypoid growth above are removed, if there be any, and the incision for drainage is made in the posterior commissure. The incision I prefer posteriorly wherever the fissure may be located, as a more satisfactory incision can be made here with least injury to the sphincter muscle. Only the superficial circular fibers of the external sphincter are cut through while the important fibers of the external sphincter are merely separated longitudinally. Also with this incision we can better see and feel the depression between the sphincters and definitely avoid injury to the internal sphincter.

Whether the fissure is entirely below the internal sphincter or begins slightly above it, there is no

need of making the incision through any of the fibers of the internal sphincter. The further advantage of this long, shallow incision is that dressings are more easily made; the incision can be opened up easily by pulling up and down on the buttocks, and a piece of gauze can then be easily and painlessly inserted. This incision can be kept open longer than the shorter ones, but can be allowed to heal in a few days if we so desire. With this incision I do not remember a case of any degree of incontinence. With such an incision I have never had a failure to cure where there was no fis-

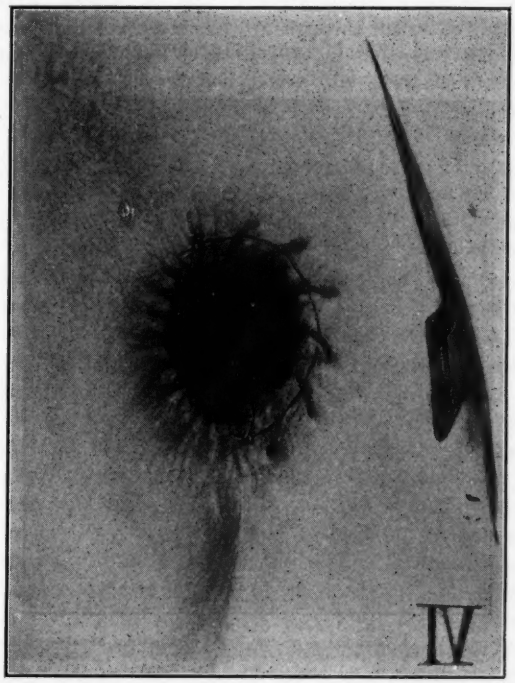

Figure 4.

tulous opening in the ulcer and where the ulceration was not tuberculous. On the other hand I have several times operated on cases that had been previously operated on one or more times.

FISTULA IN ANO.

There may be only a single straight tract which may remain so and drain well indefinitely. This, however, is not the rule. These tracts stop up, here and there, and there is renewed inflammation, formation of an abscess, its rupture, and the formation of a new tract, or a prolongation from the old tract, and so on indefinitely in some cases, until the very existence of the patient is threatened by the infected region around the buttocks, ischio-rectal spaces, sacrum and pelvis generally.

The fact, however, that operations for fistula require cutting of one or more of the sphincter muscles with frequently some degree of incontinence, and at times a very troublesome incontinence, makes some surgeons, or I might say many surgeons, hesitate to operate on some fistulas, particularly those where the internal opening is above the internal sphincter. Others will cut the sphincters, feeling that little or no incontinence will result if the fibers are cut at right angles. This may be true in some cases and more frequently in the hands of some men, but I have seen some very bad results following cutting both sphincters at right angles, particularly when the incision was in either anterior quadrant in women.

The operator who makes it a rule not to cut through both sphincters, preferring a fistula to incontinence, is acting wisely if the fistula drains well and there is not any further abscess formation with tracts becoming more extended and tissues becoming more extensively involved.

The operator who cuts through both sphincters in order to cure fistula is acting wisely if his cases are not destined to drain well, but rather to become closed in part and produce more abscesses and more tracts and so on indefinitely until the whole peri-rectal and peri-anal regions are honeycombed.

In fistula we are confronted with a situation which we prefer to get rid of because it is dangerous to keep it. On the other hand, the means of getting rid of fistula we do not like to employ because of the possibility of producing an incontinence which would be much more troublesome than many a fistula.

I have seen many cases of incontinence, and there is nothing more deplorable. These patients regret ever having permitted the operation and the surgeon regrets ever having performed it. Because of these occasional unfortunate results many patients are deterred from submitting to operations by which we could cure them without any degree of incontinence. I have known of patients who refused operation for even hemorrhoids because they had known of others who had been operated on and left with incontinence. This experience is more frequent in cases of fistula.

The incontinence sometimes results from repeated operations—repeated cutting of the sphincter, where, had the first operation been successful we would in all probability have had no noticeable functional defect. It is for this reason that I have previously urged the importance of not beginning the operation on any fistula of long standing until the internal opening has been demonstrated, and when demonstrated, so preserved until time of operation by passing a ligature through and tying.

Then when we are not taking chances about finding the internal opening we can feel reasonably sure of effecting a cure with the one operation and in this way tend to eliminate some of the incontinence that follows many operations, but which would be negligible if only one operation had sufficed to cure.

After this our greatest concern is the procedure which will least impair the sphincter. The methods of incision or excision alone are frequently followed by much impairment of function if both sphincters are cut.

The method of excision with immediate suture of the wound was first employed by Cassaignac in 1856; it soon fell into disuse but was later revived by Stephen Smith of New York. The functional result after this operation is much better than by the method of simple incision or excision, and when primary union can be secured, the results are very good. It is, however, difficult to obtain primary union in this region. In my experience the majority of the wounds become infected and have to be opened and treated as a simple excision. I would therefore advise that no attempt be made to seal the wound as is frequently done, but that some drainage be used at the outer angle for twenty-four to forty-eight hours. I saw one case that died of infection after excision and sewing up the wound, and that in the hands of a man of wide experience.

One method I have employed when the sphincter had to be cut in more than one place or where both sphincters had to be cut, is the use of a ligature in a peculiar way: The ligature is placed through and brought out of the anus. Then with one end in either hand it is worked to and fro until the patient complains of pain; then the ligature is tied snugly enough to hold it in contact with the edge of the fistula nearest the skin. This is repeated three times a week, thus slowly incising the fistula from within outward, each time making a new path for the ligature which allows the deeper parts of the fistulous tract all along its course to heal. By this means the fistula is gradually brought nearer the skin and the internal opening is slowly transferred from a higher to a lower position. My object in this slow procedure is to allow the sphincter to be cut through slowly so that the first fibers cut have time to become fixed in the cicatrix before the more superficial fibers are cut. The same is true of the other tissues—the deeper ones are healing while those just superficial to them are being cut. This does not allow separation of much thickness of tissue at one time.

This is not altogether the principle of the elastic or plain ligature slowly applied. When properly applied the cutting is done by drawing the ligature to and fro at the time of treatment and not by pressure after being tied. This is demonstrated by the fact that the skin is not cut through until the last step of the operation, when it may be done with the knife under cocaine after the sphincter has thus been secured and not allowed to retract. I have one case so treated where the external sphincter was cut twice and the internal sphincter was cut once with absolutely no incontinence, even to fluid movements. I was able, however, to appreciate with the finger that the sphincter was slightly less powerful than when I began the work, although the functional result was good. Eleven weeks were required to cut through in this case. Another case which I treated by this method had been in the

Figure V. A photograph of two casts of the anal canal—reduced 4½ times. Actual cast was 2¾ inches long. The bulbous portion (a) corresponds to the anal cavity. The depression (b) is made by the internal sphincter. The depression (c) is made by the external sphincter.

hospital for four months, had had two or more operations and was far from cured. There were two external openings; one on the right side of the anus about two inches from the anus, the other was by the side of the sacrum on the right side. The whole buttock was indurated and another abscess was starting near the opening by the side of the sacrum. Methylene blue and peroxide of hydrogen injected in the opening nearest the rectum was found in the bowel, and a week later the same solution injected in the opening by the side of the sacrum found its way to the rectum and also came out of the nearer external opening. There were solution injected in the opening by the side of the internal sphincter on the right side, and the other about one and a half inches above the internal sphincter and on the posterior wall of the gut. The

sphincter had been cut and the anal opening was pear-shaped. The man did not complain of incontinence but regularly had formed movements.

Even though the fluid injected in the external openings went into the rectum I could not get a probe through.

Because of the extensive involvement and because the patient was thoroughly incapacitated for many months, four of which were spent in the hospital, it was not a case where I had any choice as to whether operation be performed or not. I had shortly prior to this time seen a few cases of most troublesome incontinence and hesitated, in this case, to cut through the sphincters already partially disabled. Accordingly I chose the slow method of cutting through above mentioned. I will mention here that the ligatures were threaded through by the washing process recently described in another article.

One or two inches of a No. 3 or 5 black ligature was crowded into the external opening and then the fistula was injected with a weak solution of peroxide of hydrogen; more silk was crowded in, followed by more fluid under slight pressure and so on until twelve or fifteen inches of silk were used, when the silk was found in the rectum. It was only after six attempts, however, that I got ligatures through both tracts. When these ligatures were removed, after using them as guides to place in others, they were measured. The longer one measured ten inches and the shorter one six and a half inches. Fifteen weeks were consumed in cutting through the tissues to the point where the string in the longer tract measured two and three-fourths inches and this remaining tissue was cut through with the knife under cocaine. The shorter tract was completely cut through in thirteen weeks. The pressure on this ligature had been greater than I had intended to make it, and the skin was gradually cut through by the ligature near the end of the operation. With the longer tract the skin was cut only slowly at the edge of the external opening.

There was, as a rule, some pain for six or eight hours after treatment, and at times one or two half-grain doses of codeine were necessary. On a few occasions when the suture was drawn too tight the patient was uncomfortable for a whole night.

Now, after both sphincters have been cut through twice by this method the patient has no incontinence except to decidedly fluid movements.

This method is very tedious and at times painful, and but few patients would continue the treatment long enough for the very long tracts to be cut through. A much larger number would submit to the shorter tracts being cut through by this method.

Because of the tediousness of this operation I intend to apply a modification of this method in some cases in the future in order to shorten the treatment. I propose to use the knife under cocaine, cutting only about one-fourth of an inch at a sitting from the fistulous tract outward, and then draw the ligature snugly to hold open the most superficial parts of the incision while the old fistulous tract and the adjacent part of the incision are allowed to heal; and so continue until the sphincters have been cut through, after which all the overlying tissues may be cut through at one sitting without further impairment of the sphincter. I believe this will shorten the treatment and be less painful than cutting with the ligature; at the same time it seems possible to cut through the sphincters with the knife slowly enough to allow them to become entrapped in the cicatrix and thus prevent the wide separation which so frequently occurs when they are incised at one sitting.

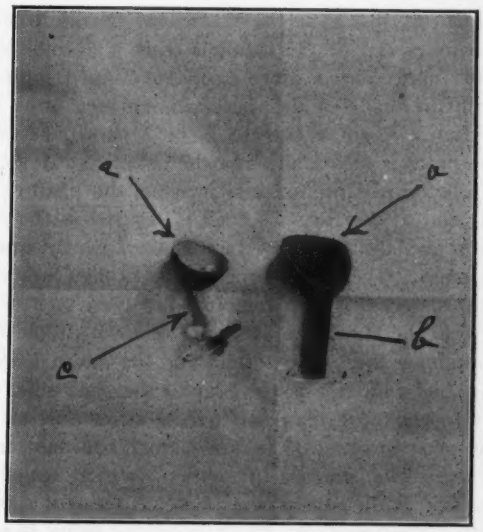

Figure VI. Drainage tubes for the anal canal—reduced 4½ times. (a) Hollow rubber hemisphere; (b) perforated rubber tube; (c) perforated rubber tube covered with a gauze sleeve.

EXCISION WITHOUT CUTTING THE SPHINCTERS.

A slightly curved incision two and a half to three and a half inches long is made parallel to the fibers of the external sphincter with the external fistulous opening at the middle of the incision. A probe with a short handle, or a grooved director is passed through the fistulous tract, the point coming outside and the handle remaining in the rectum, i. e., it should be passed from within outward. Then, while gentle traction is made on the point of the probe the incision is deepened, following the fistu-

lous tract to the rectal wall, using care not to cut through the fistulous tract on the probe, or into the rectum and thus infect the wound. When the fistulous tract is thus completely dissected out on the probe, the latter is withdrawn and the outer end of the fistulous tract is cauterized with pure phenol and ligated, and the end of the ligature is left long. Then the retractors are removed from the outer incision and the walls of the incision are allowed to fall together. Then the small blade of the speculum is introduced in the rectum on the side opposite the internal opening, and while gentle traction is made, another incision is made at the edge of the anus and the mucous membrane is dissected up, just as in the Whitehead operation, until the inner end of the fistulous tract is encountered. This dissection is more easily continued upward with the blade of the speculum removed from the rectum. A small forceps is next passed between the mucous membrane and the sphincters down to the bottom of the original incision, the ligature on the end of the fistulous tract is secured in the forceps and the fistulous tract is then gently drawn through. The mucous membrane is then still further dissected up until enough has been secured to sew to the skin edge after the removal of the flap containing the fistulous tract and the internal opening. The incision at the edge of the anus must extend over more than half of the circumference of the anus in order to secure enough mucous membrane. The mucous membrane is then sewed to the skin at the edge of the anus. A piece of rubber tissue is inserted into the outer wound to its deepest parts to prevent accumulation of serum next to the rectal mucosa. The outer wound is not sutured. A few strips of iodoformized gauze are inserted into the rectum, then a rubber drainage tube of good size; a large safety pin is passed through the outer end of the tube to prevent it from being driven inward. The wounds are further dressed with a little iodoformized gauze and plain gauze and the dressing is secured by adhesive straps across the buttocks and by a T-bandage.

The bowels are confined for a week to ten days. This is accomplished by having the patient thoroughly cleaned out before the operation and by the administration after the operation of ten to fifteen minims of deodorized tincture of opium t. i. d. and by allowing only broths for one week and after that a light diet.

The tube keeps the patient free from gas and much more comfortable than otherwise. The drainage from the outer wound is removed after 24 to 48 hours, and every day any soiled dressings are replaced. Before the tube is removed, at the end of a week or ten days, about six ounces of olive oil are injected into the rectum through the tube.

The preliminary preparation of the patient is the administration of a dose of calomel two days before the operation, castor oil one day before the operation, and an enema five or six hours before the operation; also one hour before the operation ¼ grain of morphine and 1/150 grain of atropine are given subcutaneously.

This operation I have employed in three cases, all of them women. In two cases the internal opening was anteriorly and to one side of the median line; in one of these cases the external opening was far from the anus; in the other case the external opening was 1½ inches from the anus and the external sphincter had been cut once at a previous operation and was somewhat relaxed and could not be safely cut again. The third case was one where the abscess was deeply located in the superior pelvi-rectal space. Before coming into my hands she had been in a good hospital for two or three weeks where the symptoms had gradually subsided but did not entirely disappear. There was no history of sudden relief or of discharge of pus with the movements. She was sent to the country as the surgeon thought a rest would suffice to complete the cure, but shortly afterward the pain in the perineum and rectum, more marked on sitting and on walking, again appeared, only slowly to subside to a certain degree when the whole experience was gone over again and again at intervals of three to four weeks. When I saw her she had been a semi-invalid for many months. She was sent into the hospital where the abscess was opened under general anesthesia, and the cavity injected with methylene blue and peroxide of hydrogen, but no internal opening was found. The wound refused to heal and the sinus was injected at different times with the same solution. After several injections the internal opening was discovered one inch above the internal sphincter anteriorly and to one side of the median line; a ligature was placed through and kept in position a few weeks. During these few weeks I applied the slow cutting process with the ligature until the internal opening was transferred downward to about 1/3 to ¼ inch above the sphincter (internal) when the operation of excision without cutting the sphincters was employed.

All of the three cases in which I have employed this operation healed nicely with no impairment of sphincter power. The outer wound healed slowly by granulation. I did not sew up the outer wound in my first case because I considered drainage of greatest importance; but when I saw how this

wound acted I did not sew up the external wounds in the other cases for an additional reason. It was surprising to me to see that there was no gaping of this wound when left unsewed, but that there was a displacement of the segment, between the external incision and the anus, upward as if to fill in dead space. The surface left to granulate was only the fat on the outer side of the incision.

Figure 1 shows the external wound retracted, and the fistulous tract dissected out on the probe, the handle of which can be seen in the rectum.

Figure 2 shows the same enlarged with the wound widely retracted.

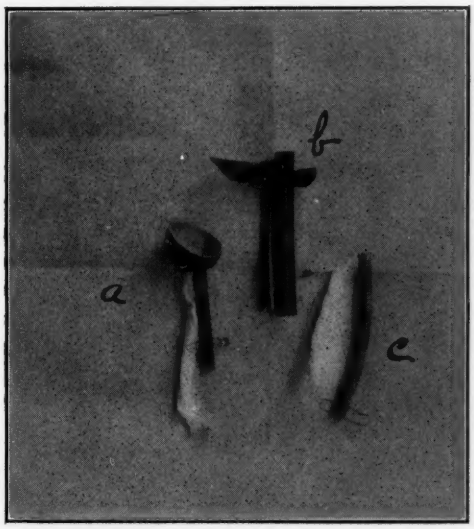

Figure VII. (a) Drainage tube for anal canal composed of a hollow rubber hemisphere, a rubber tube below not perforated, and a strip of gauze behind for drainage. (b) A drainage tube for anal canal composed of a larger tube and two pieces of soft rubber catheter fastened above to a short piece of large rubber tube at an angle of 90 degrees for retaining it in the anal canal. (c) Drainage tube for anal canal composed of a plain rubber tube with gauze fixed behind for drainage, and a safety pin through the outer end.

Figure 3 shows the flap of mucous membrane dissected up from the side and anterior surface of the anus and rectum still carrying the internal opening and the fistulous tract which has been drawn through from the external wound to the incision between the mucous membrane and the sphincters; it also shows the knife in position to cut off this flap just above the internal opening of the fistula.

Figure 4 shows the mucous membrane that has been dissected up after removal of the flap, brought down and sewed to the skin edge. It also shows the rubber tissue drain in position in the outer wound.

The operation of *excision without cutting the sphincter* is of course much more difficult than the method of simple incision or of simple excision. One hundred per cent successful in three cases does not mean necessarily 100% successful in a large number of cases. I am, therefore, at present not recommending this operation for all cases of fistula, but only for those where it would seem quite possible for the ordinary methods of excision or incision to produce some degree of incontinence. If the internal opening is unmistakably located between the sphincters and the sphincters have perfect power and have not been previously cut, simple incision or excision may be expected to produce an almost perfect result; if, however, the internal opening be between the sphincters and there be a weak sphincter or the external sphincter has been previously cut, there is reason to fear some degree of incontinence from any cutting of the sphincter, and in such cases I would suggest excision without cutting the sphincter. Where the internal opening is above the internal sphincter this operation should be regularly resorted to alone or in combination with the slow cutting with the ligature above described when the internal opening is an inch or more above the internal sphincter. I would make a few exceptions, however: (1) Cases where the internal opening is above the internal sphincter and where the external opening is very near the edge of the anus or inside the external sphincter fibers; an incision in such cases would still leave some or all of the external sphincter fibers intact. (2) Cases of very extensive involvement with numerous internal openings widely separated. These cases are fortunately comparatively rare.

If in doing the operation of excision without cutting the sphincters the gut is punctured, or if the mucous membrane after being sewed to the skin is on too great tension, then it is apt to slough and leave an opening in it and consequently a fistula will persist. I see no dangerous probabilities in the operation. If it should fail, we still have the sphincters unimpaired by the operation and the sphincters could then be cut through and the operation converted into the method of simple excision.

PERFORATING ULCER.

When perforation of a duodenal ulcer has occurred, difficulty in diagnosis may arise owing to—(*a*) the pain being referred to the appendix region; (*b*) early and marked abatement of the severity of symptoms in cases where leakage from the perforation is limited by early adhesion taking place, or by edematous swelling of the intestinal wall in cases of very minute perforation.—J. W. STRUTHERS in *The Edinburgh Medical Journal.*

ACUTE OSTEOMYELITIS AND ITS COMPLICATIONS.*

LEWIS W. ALLEN, M.D.,
Visiting Surgeon to St. Luke's Hospital.
SAN FRANCISCO.

As preliminary to a consideration of this subject, I wish to call attention to certain factors in the embryology and histology of bones that influence the pathology and course of osteomyelitic infections. Embryologically, it is to be remembered that bones are derived from the mesoderm and therefore are a true connective tissue, subject to infections similar to those of the other connective tissue and running a similar course, modified only by the special characteristics which bone has undergone in assuming its special functions. I shall draw more particular attention to this in speaking of the pathology of this disease. As we are interested surgically in the regeneration of bone, your attention must be drawn for a moment to the process of bone formation.

Without going into the minute details of this process I wish to lay especial stress upon the fact that the osteoblasts are contained not only in the inner layer of the periosteum, but also in the lacunæ between the lamellæ, and along the walls of the Haversian canals throughout the bone. In the process of regeneration the latter hold a place of equal importance with the former in the young, and assume the major rôle in the adult. Besides these osteoblasts, or osteogenetic cells, there is present in the bone destroying cells, or osteoclasts, which, in the embryonic development of bone open a path for the Haversian system, and are similarly active in the absorption of foreign material surgically introduced as a framework for the regeneration of diseased bone.

Surgically we are also vitally interested in the epiphyseal, or growth line in long bones. It is well understood that any interference with the epiphyseal cartilage in the young before the bone has attained its full length, will interfere with the proper growth of that bone. It is an interesting fact also that this cartilage serves as a barrier to osteomyelitic infection which always starts in the shaft of the bone, as well as a protection to the shaft from infections, such as tuberculosis, which originate in the epiphysis. Thus acute infections in the shaft less readily extend to the joint in the young than in the adult. So also, acute suppurative arthritis less often produces a complicating osteomyelitis in the young than in the adult.

* Read before the St. Francis Clinical Society, S. F., May 31, 1912.

HISTOLOGY.

It is not my intention to dwell on the familiar histology of bone structure, but simply to emphasize the point that although the macroscopical conception of bone, e. g., of a long bone, is one of hardness and immutability with little power of intercommunication between one portion and the other, in reality it has a complete system of intercommunicating canals, and has great power of changing both its size and shape; it can hypertrophy or atrophy under systemic influences as do the other tissues of the body. As the vast majority of osteomyelitic infections are in the long bones, perhaps because they bear the greatest strain and are more subject to trauma, we are chiefly concerned with the structure of these.

Briefly, we have first the periosteum, the enveloping membrane. Although fibrous and containing no salts, it should be distinctly considered an essential part of the structure of bones. Within this is the cortex, composed of the outer compact tissue fading gradually into the more or less porous or open cancellous tissue; while within, is the cylindrical cavity containing the marrow. The marrow is composed of a matrix of fibrous tissue supporting the blood vessels, areolar tissue, fat, lymphoid cells and normoblasts. The marrow not only fills the central cavity but extends into the Harversian canals. It is to be remembered that there is a communicating system from one end of the bone to the other—tortuous, but nevertheless complete; and that because of the nature of bone construction with its hard outer shell and its soft and non-resisting inner canal, infection in the marrow, unlike phlegmons spreading in the ordinary connective tissue, travels in the line of least resistance lengthwise rather than to the soft parts outside the bone. Yet the processes as we will see in taking up the pathology of this affection are essentially the same.

CLASSIFICATION.

Histologically, acute infections of bones may be classified as periostitis, or inflammation of the periosteum; osteitis, or inflammation of the cortex of the bone; and osteomyelitis, or inflammation of the bone marrow. But, as all the different tissues of the bone are usually involved in the acute infections of bones, we will not attempt to make the distinction, but apply the now generally used term of osteomyelitis to include them all. *Bacteriologically,* we speak of osteomyelitis as staphylococcic, streptococcic, pneumococcic, typhoidal or syphilitic. Acute infectious osteomyelitis in by far the large majority of cases is represented by the staphylococcus aureus; the chronic by the typhoid bacillus and the spirochaeta pallida. *Clinically,* we have to

deal with acute and chronic bone infections. It is the intention of this paper to consider only acute infectious osteomyelitis and its sequalæ.

ETIOLOGY.

Bone may be infected in two ways—ectogenous from trauma, which includes infection from neighboring contusions, fractures, and operations such as resections of joints, amputations, and osteotomies; and endogenous, or hematogenic, in which bacteria or infected emboli are carried through the blood and lodged in parts of the bone where anatomical conditions are especially favorable to their further growth, or a lack of resistance has been provided by some previous injury or circulatory disturbance. The direct cause of acute infectious osteomyelitis is always an infection by pyogenic bacteria. Any pyogenic organism capable of being carried in the blood may be deposited in the bone and cause suppuration, some seeming to have a preference for the bone marrow, others for the cortex and beneath the periosteum. Those found most frequently in ectogenous infections are the staphylococcus aureus and albus, and the streptococcus; while the hematogenous infection is due in the large majority of cases to the staphylococcus aureus, which is probably to be explained by the fact that this organism is the one most frequently found in the original focus, as a tonsilitis, an acute otitis media, a furuncle or a carbuncle. Yet in some cases the osteomyelitic focus seems to be the primary focus of the disease. Certain general predisposing causes seem to favor bone infection, such as lowered vitality, following the exanthemata or any prolonged disease. It more often affects children and young adults whose bones are still in the process of development, yet it is quite common in adults and occasionally affects the aged.

PATHOLOGY.

Whether the bone is infected from within or without, the pathological changes are eventually the same except that the order in which tissues are affected is reversed. It will be sufficient for the purpose of this paper to briefly note the progress in a hematogenous infection. The primary focus of infection is always in the bone marrow in the diaphysis of the long bone, and usually in that spongy portion lying next to the epiphysis which Kocher has termed the "metaphysis." Clinically, this is an important point, as tuberculous infections practically always begin in the epiphysis. The kinds of bone infections are similar to those of other connective tissue inflammations in that we have phlegmons and localized abscesses, only differing in their course because of the specialized structure of bone.

The walling-off is slower as bone is less vascular and the necrosis is more extensive as the bone is rigid and the circulation through it is slow. But when the process is arrested we have the same picture here as in the soft tissues; extension in the marrow is checked by granulations; in the cortex by a thickening and hardening. The infecting bacteria once lodged in the marrow may produce a necrosis extending over a very considerable area of a long bone before marked infiltration with leucocytes can occur. Clinically, it is of the utmost importance to bear these facts in mind, to determine in the acute cases whether we have a phlegmon which usually extends early from one end of the diaphysis to the other, or whether it is simply a localized abscess. For properly attacking these inflammations a correct understanding of the pathological changes goes hand in hand with a careful study of the symptoms.

Generally, an inflammatory exudate and suppuration beneath the periosteum and in the cortex usually occurs quite early by extension through the Haversian canals, often stripping the periosteum from the bone over large areas. It may then extend to the adjacent soft tissues—muscles and subcutaneous tissues—forming an abscess outside the periosteum and even perforating the skin. Although usually confined to the diaphysis by the epiphyseal cartilage, it may extend, especially in adults, because of the ossification of the epiphyseal line, to the epiphysis, and through it to the joint, producing an acute suppurative arthritis.

Depending upon the severity of the infection, the resistance of the individual and the time of the interference, the cortex may become necrotic over more or less extensive areas. Destruction of the endosteum produces a necrosis of the inner layers of the cortex; separation of the periosteum, a necrosis of the outer layers; involvement of both endosteum and periosteum produces a complete cortical destruction.

Clinically, when one finds a separation of the periosteum one may be sure that at least that much of the bared bone, and usually much more, will represent the extent of the sequestrum to be removed later.

REPAIR.

Occasionally the marrow may be infected throughout with no necrosis of the cortex, or appearance of pus beneath the periosteum; only a general ebonization of the outer shell being present as exemplified in one of the cases to be cited later. Usually a portion of the infected marrow and cortex becomes completely necrotic, which portion may

vary in extent within wide limits; and the lime-bearing portion of the bone persists as a more or less extensive sequestrum. Repair inside of the marrow is produced by granulation tissue from the reticulum of the marrow, and by the formation of bone from the endosteum; externally, it is produced by the periosteum and is known as the involucrum.

In performing a sequestrotomy eight or ten weeks after the subsidence of an acute infective osteomyelitis in which the suppurative process has lifted the periosteum from the bone, one must go through this involucrum to reach the sequestrum, and the extent of this new formation indicates the extent of the search for the sequestra. In the chronic cases that have lasted for a year or more it is necessary in order to obtain proper healing power to not only curette this inner deposit, but sometimes to remove it entirely as well as the terminal marrow plugs because their hardness and impermeability make healing unlikely.

The gross appearance of the marrow, cortex and periosteum varies with the extent of the disease, and the judgment of the surgeon is often taxed to know what should or should not be removed. There may be a localized abscess in the marrow. The soft and flabby granulations extending away from it above and below with localized areas of necrosis in the inner side of the cortex will, if left, prevent healing. We are apt to err in doing too little rather than too much. As with an ischio-rectal fistula, or in the cleaning of an old necrotic mastoid, all the flabby granulative tissue must be removed and followed out to the limit wheresoever it may lead, or we fail of complete success.

SYMPTOMS.

The symptoms of acute osteomyelitis differ with the virulence of the infecting organism, the place of its lodgment, and the resistance of the individual. The most severe type of acute hematogenous suppurative osteomyelitis—a veritable phlegmon of the bone—begins with a chill and an early and profound change in the general condition of the patient; dry tongue, foul breath, and intense gastric disturbance. The pulse is rapid and the temperature high with the early development of a delirium, the whole being a vivid picture of an intense septic condition. Leucocytosis is usually high. Locally, the first symptom is pain, which in this type is intense and agonizing, until there is an outlet through the periosteum. The swelling of the soft parts, which usually appears early, is one of the most characteristic features of osteomyelitis. In my experience it differs from that of all other acute infections. It is neither red nor hot, but is an edematous infiltration and thickening of the tissues. It extends over a considerable area above and below the point of maximum bone infection. It is not tender to superficial palpation, but deep pressure upon the bone causes pain. This is before the subcutaneous tissues have become infected. When the infection has spread to the tissues around the bone a secondary phlegmon or a circumscribed abscess may overshadow the origin of the trouble.

Such a typical case is not apt to be overlooked, especially after infection of the soft parts has developed. But the diagnosis of early cases, particularly in infants, who cannot tell you where the pain is, is often difficult. Then again, sometimes the pain, even in very extensive lesions of the marrow, is not severe for several days. Again, the patient may be so overwhelmed with the toxines that he may be in a low delirium when first seen by the physician.

Chronic osteomyelitis is most often the sequela of the acute infection, its symptoms being quite characteristic. There is a diffuse enlargement due partly to a thickening of the soft tissues, partly to the formation of the involucrum. The surface is punctured in one or more places by the opening of sinuses which run down to areas of necrosis containing sequestra with the characteristic ivory feeling of dead bone, or rarely, to a cavity of pus in the bone which has failed to heal because of a too sclerotic wall. At times the sinus may close, only to break open again in a few weeks or months. Nature's methods of extruding a sequestrum is slow and tedious, and new areas may become infected before the dead bone is thrown off and the cavity healed. Then again the walls of the cavity may become so dense as to shut off all proper circulation, thus preventing any possibility of ever healing.

DIAGNOSIS.

The different types of this affection may resemble acute arthritis, gonorrheal, tubercular or rheumatic, typhoid fever and tuberculous invasion of the epiphysis. Those cases in which the ends of the bone develop a swelling insiduously without signs of inflammation or fistula formation may simulate a myelogenous or periosteal sarcoma, or a bone cyst. Thick masses of periosteal scar resulting from previous inflammation may give a picture of sarcoma, or gumma; thinner and more diffuse ones make a differential diagnosis from syphilitic ostitis necessary.

It is often a difficult matter to determine between an acute hematogenous osteomyelitis and an acute infectious arthritis, especially in an infant. The more profound general toxemia, the higher leucocytosis, and locally the thickening of the soft parts extending some distance from the joint, together

with bone tenderness, would lead to a diagnosis of osteomyelitis. The fact that rheumatic arthritis usually affects more than one joint is not very helpful in the first and second day stage of acute hematogenous osteomyelitis, when it is so important to interfere, because involvement of the joints is not simultaneous.

In gonorrheal arthritis one joint only may be affected and the early symptoms may be severe, but bone tenderness is lacking, and usually the history of an earlier attack of gonorrhea can be determined. High leucocytosis combined with the development of local symptoms will differentiate it from typhoid fever. High leucocytosis together with a negative tuberculine reaction will also distinguish it from acute tuberculosis of the epiphysis or joint.

In the chronic forms the *x*-ray may reveal a bone softening in cases where no sinus has opened or sequestrum formed. On the other hand the plate may give no aid. Yet, in looking forward to a sequestrotomy, the injection of a sinus with bismuth paste and the taking of an *x*-ray negative may be very helpful in arriving at a correct idea of the extent of the operation necessary. It will be found, however, in practice that a more extensive resection is demanded than the negative shows. It will, however, occasionally save the surgeon from hunting for a sequestrum in the bone when the trouble is really in some other tissue. Femurs have been opened for a psoas abscess.

Chronic epiphyseal foci point to a tuberculous infection, especially if accompanied by serous synovitis; but occasionally a chronic infective osteomyelitis involves the epiphysis and extends to the joint. Bacterial examination and the application of every diagnostic test should be utilized in these cases. A negative Wassermann reaction would rule out gumma, syphilitic ostitis and periostitis. Rarely, bone cysts and sarcoma may be impossible of differentiation from these chronic forms of osteomyelitis without an operation.

TREATMENT.

Once the diagnosis is made, the only treatment is surgical. In some of the mildest infections without the usual intense constitutional reaction, putting the part at rest with the proper application of the Bier bandage may cause the whole affair to subside, as the following case will illustrate.

Mr. X., age 23, a checker, had increasing pain and swelling in left forearm for two days. No chill, no trauma, no known or apparent skin lesion, no history of syphilis, or typhoid. Diffuse swelling without redness in middle third of forearm, anteriorly and posteriorly. Tenderness to pressure over ulnar. Temperature 101°, pulse 96. This case being on the border line between a severe and mild infection, I determined to try the Bier bandage. Having adjusted it I directed the patient to return in ten hours with instructions to keep the bandage on for eight hours. Except for a carthartic he was to rest body and arm in the meantime. At the end of ten hours, deciding that the swelling of the arm was no worse, his temperature having dropped a degree, the bandage was reapplied and patient was directed to return again in ten hours. On his second return the swelling had distinctly diminished, pain was less and temperature 99°. The treatment was continued, with the result that the infection had practically disappeared in another 24 hours.

In the severe infections the systemic invasion presents an entirely different picture—chill, high temperature, rapid pulse, intense leucocytosis, severe pain and marked swelling. Here action, and that as early as possible, is imperative. If seen early, incision of the periosteum and opening the bone for drainage of the marrow may save the bone from extensive destruction and check the constitutional invasion. If seen later, after pus has formed underneath the periosteum, lifting it away from the bone to a greater or less extent and possibly having passed into the surrounding soft tissues, accompanied by a general and profound septicemia, the operation must be performed as a life-saving procedure, with ample drainage beneath the periosteum and exits at the lowest and best angle. We must always open the bone into the marrow as quickly as possible; drain superficial phlegmons and abscesses thoroughly and give the patient vigorous supportive treatment. The following is an illustrative case:

E. M., age 2 yrs., referred to me by Dr. Torello, entered St. Luke's Hospital October 7, 1902, suffering from a swollen and very tender left thigh, lower third. His sickness had been developing for a few days before entering, coming on without any known cause. Temperature 106.2°, pulse 150. White blood count 36,000. Operation was performed immediately, and pus was found in the fascia, underneath the periosteum, and, on opening the bone, in the marrow. It was thoroughly drained, the gauze running through and through from inner to outer side of the thigh, and also posteriorly, that there might be no retention. Culture from the bone showed staphylococcus aureus. The temperature and leucocytosis dropped somewhat after the operation, but the child ran along in a very septic condition for ten days, when an osteomyelitis developed in the right humerus above the lower epiphysis. This being opened, pus was evacuated which gave another pure culture of the staphylococcus aureus. Convalescence was slow, but the wounds early ceased discharging, became covered with healthy granulations, and the patient left the hospital November 9, 1902, with pulse still up to 130 and temperature 100°. Later all the wounds closed, which to me, however, did not bring any hope of permanency, but caused me to impress upon the parents

the necessity of looking forward to a second operation so that there would not be any misunderstanding or disappointment.

If the drainage is sufficient, permitting no accumulation of pus, the intervening two months or so up to the time for the sequestrotomy will see a great improvement in the health and weight of the patient. If the original interference has been too late, or the drainage insufficient, serious complications, such as a general septicemia or pyemia may develop, to which the patient may succumb, or linger along in a very precarious condition for months. In looking forward to a sequestrotomy it will be fortunate for the patient if he can have the same surgeon attend him in the second operation that he had in the primary operation. In making the original incision the surgeon is able to conceive in a general way the amount of bone destruction to be expected from the virulence of the infection and from the location and amount of pus formed. The quickness and completeness of the final cure will largely depend upon how thoroughly this secondary operation is performed. The fault usually is to do too little. The incision through the periosteum and newly formed involucrum must be extended to the upper and lower limits of the sequestrum so as to remove it in toto if possible. The marrow cavity must be opened, all necrotic tissue removed, and the soft, flabby granulations followed as far as they extend. Just as it is necessary in ischio-rectal fistulæ to follow out every branch of the granulating tract, and as in curing an obstinate mastoid infection every pocket of granulation tissue must be thoroughly curetted, so every necrotic spot or depression containing flabby granulations in the remaining portion of the shaft should be thoroughly cleaned out before closing. In order that the periosteum may come together easily it is usually necessary to remove three-fifths or more of the cortical shell, taking care not to fracture the bone while chiseling. It has been my experience that these acute cases can be cured easily and quickly by a simple but thorough necrotomy, preserving the periosteum and suturing it over the remaining clean fragment with drainage for a day or two.

The patient just referred to, E. M., re-entered St. Luke's Hospital March 4, 1903. This was five months after the primary incision. The original opening had closed rapidly after the patient left the hospital. It remained closed until just previous to his re-entering, opening through a sinus in the wound on the inner side of the thigh in its lower third. I re-opened the wound and found the sequestrum extending from the lower portion of the inner aspect of the femur around anteriorly one-half way up the femur and externally to the trochanter. The involucrum had to be excised to loosen it below. The wound on the outer surface of the thigh was re-opened and, going through the involucrum, a part of it had to be excised to get the sequestrum out whole. This, however, was finally accomplished and the marrow canal, thoroughly curetted of its rotten granulations and numerous spiculæ of dead bone, was sterilized with pure phenol. The wound was sutured except for a small space for gauze drain on either side. The patient left the hospital the next day as the operation caused no marked reaction. The after course was highly satisfactory, although the line of suture on the outer side was infected about the stitch holes. These healed rapidly after removing the stitches and treating openly. There was very little discharge from the depths of the wound at any time. Healing was rapid and uneventful. About one year later I presented this patient before the San Francisco Polyclinic Society. It was thought by some that the epiphyseal line had been destroyed in this case and doubt was expressed as to the growth of the femur. But I then expressed the belief that the removal of the sequestrum as an outer casing would not interfere with the life of the epiphyseal cartilage. Centrally there was no need of curetting into the cartilage. The femur has remained healed these nine years and has developed continuously with its mate.

In some less acute infections the radical operation may be done at once and save a long, tedious recovery by repeated curettings. The following case illustrates such:

S. H., age 22, laundryman, developed an acute swelling of the left forearm 36 hrs. before he came into my office on October 25, 1911, with a temperature of 101°, pulse 96. The upper half of the forearm was enlarged, while posteriorly, over the olecranon and head of the radius, the swelling was red and tender. Some deep soreness and aching was complained of, and pressure over the shaft of the ulna produced pain. This being another borderline case without much systemic involvement, I decided to try the Bier bandage. The next day patient reported he had the first good night since the trouble began. Temperature 98.6°, pulse 90. The swelling remained about the same, however, but it was less painful to move the elbow.

The next day I drained a subcutaneous abscess over the tip of the olecranon, evacuating about one dram of pus. There was no bone exposed here. A wet dressing was applied October 30, the elbow was better but the arm over middle of ulna unimproved. Bier treatment begun again. By November 1 it was evident that although the further progress of the disease had been controlled, the deeper trouble in the forearm was not. He entered St. Luke's Hospital November 2 and was operated upon that morning. Pus was found in the intermuscular fascia which was sufficient to account for the redness and swelling and might have caused some to hesitate from going further. But feeling sure from my observations that the bone was involved in this case, I incised and stripped back what seemed to be a perfectly normal periosteum, chis-

eled the bone which, by the way, was harder than normal, and opened into a small abscess in the marrow.

After cleaning out this abscess I found the marrow to be filled above and below with soft granulations as are found in an unhealing sinus. The bone opening was extended above and below until healthy marrow was encountered, which in this case was not until I had gone the whole length of the diaphysis. The remaining shell of bone was thoroughly curetted where in many places the granulation tissue extended down into it. The scattered foci of necrosis are the points from which trouble will spring during the process of repair, unless they are thoroughly curetted and sterilized.

The periosteum was sutured except where three drains emerged from center and both ends. These drains in a case like this are removed early, within forty-eight hours at least. In this case no pressure could be exerted over the trephined bone to close the bone cavity because of the infection in the superficial tissues which needed free drainage. The patient left the hospital two days later. He was dressed at my office during November and December. My note, January 2nd, two months from time of operation, states that arm is practically well; sinuses all healed. With such thorough cleaning out I feel sure that it will remain healed.

In the chronic cases of long-standing sequestrum, with or without multiple abscess formation, the necessity for thorough and radical necrotomy is even more urgent. Here it is to be remembered that a sclerotic process has taken place in the surrounding bone and marrow similar to the tissues in an old varicose ulcer of the leg. It is therefore necessary to remove as much of this new formed connective tissue as possible. All ebonized bone should be removed as well as the scar plugs in the marrow canal. When the destruction has been almost or entirely complete one should, even in these cases, not hesitate to remove everything. If the bone is splinted by another bone the periosteum will regenerate the entire bone to the proper size, due care being taken for two months to keep the limb splinted in the proper position, and for eight or ten months from weight bearing. This I have seen occur in adults notwithstanding the teaching that the adult periosteum contains no osteoblasts. In those unfortunate cases where the joints have become involved, the marvelous results recently reported by Murphy in which the whole joint surface and half the shaft have regenerated after resection for tumors through the introduction within the periosteum of a frail framework of a piece of the healthy tibia, or of magnesium or metal, demonstrate what may be accomplished in these cases if the periosteum is intact and freely cleared. Personally, I never have found the need of the various pastes and filling wax to close these cavities. They are merely building materials and I believe a sterile blood clot or serum clot is more efficacious provided always the necrosis and the sclerosis have been thoroughly removed.

A NEW METHOD OF DIAGNOSTICATING RENAL TUBERCULOSIS.*

(Cystoscopic excision of mucous membrane at ureteral meatus.)

LEO BUERGER, M.D.,

Associate Genito-Urinary Surgeon and Associate in Surgical Pathology, Mount Sinai Hospital; Associate Surgeon Har Moriah Hospital,

NEW YORK CITY.

Although the diagnosis of renal tuberculosis, by means of cystoscopic examination, may be easy, we are not infrequently confronted with patients in whom the symptoms and objective findings are not sufficiently characteristic to warrant a positive diagnosis. Then, too, the cystoscopic findings are often meager, and tubercle bacilli cannot be demonstrated. To wait for the results of guinea-pig inoculation means a delay of from four to six weeks and even this is frequently unreliable because of temporary exclusion of the infected kidney by occlusion of the affected ureter. It has been frequently pointed out that alterations in the ureteral orifice almost regularly accompany disease of the corresponding kidney. Although theoretically it is easy to set down dicta regarding diagnosis, in practice our doubts may be so pronounced that the patient will refuse to consent to an exploratory operation on the kidney.

When vesical ulcerations are present, when urine can be obtained from the affected kidney, and when tubercle bacilli can be found, we will rarely hesitate in giving a positive opinion as to the existence of unilateral renal tuberculosis. When, however, tubercle bacilli are absent, when there are no definite findings in the ureteral orifice—or simply edema swelling and suspicious lesion—and when no urine can be obtained from the suspected side, we are dealing with a problem the solution of which has engaged the attention of urologists for many years.

In a recent case in which vesical symptoms were present, the question as to the existence of renal tuberculosis arose, and the diagnosis would probably have remained in doubt for a long time because of the absence of conclusive findings, had we not employed a new method of investigation with the operating cystoscope. (Fig. 1.)

The following is the history of the case:

C. H. 30 years of age, Pole, hatter, who was kindly referred to me by Dr. A. Zurawski (Chi-

*From the Genito-Urinary Service and Department of Surgical Pathology, Mount Sinai Hospital, New York.

cago), consulted me on December 7, 1912, for "bladder trouble" which, according to his story, had begun about a year ago. His family history was negative, as well as the past history. At the onset of his illness, he noticed a dull pain in the lower part of his abdomen, later on associated with increased frequency of micturition. At times, the act of urination caused slight burning and during one so-called "attack," which lasted for a day or so, he had to empty his bladder every few minutes because of a burning sensation in the penis.

At times, he felt perfectly well and there never had been any acute attacks of renal colic. His weight, too, had kept pretty constant. Sometimes the urine appeared to him to be slightly cloudy, and recently he developed a new symptom, namely, a dull pain in the back not localized on either side. When he presented himself he voided about every two hours during the day and about once at night.

On December 7, 1912, the physical examination was negative, except that the lower pole of the left kidney was palpable. His urine was slightly cloudy and contained a few pus cells, a very few red blood cells, a very slight trace of albumin. The presumptive diagnosis of tuberculosis involving one or the other kidney was made, and the patient was referred to the Mount Sinai Hospital where he was admitted on December 14th.

On admission, the patient's condition was not materially changed, except that his urinary symptoms had improved, he was now voiding perfectly clear urine every two or three hours during the day, and once during the night.

On December 15th, the urine report was as follows: Sp. gr. 1020; acid; clear; centrifuged specimen containing a very few red blood cells. On December 16th, 24 hour specimen (2000 cc) showed an occasional white blood cell, 36 gm. of urea (1.8 per cent).

Physical Examination.—A fairly well nourished, tall, muscular individual whose physical examination is practically negative, save for the fact that the lower pole of the left kidney is palpable. This is not tender to deep pressure.

On December 16th, 17th, centrifuged specimens of the urine were carefully examined for tubercle bacilli and were reported negative. The urine was also injected into guinea-pig for tuberculosis.

On December 17th, a tally was made of the frequency of urination and it was found that he voided six times in 12 hours, and once at night. On the same date, the *x*-ray examination of the urinary tract was negative.

December 17th, *Cystoscopy*: The bladder interior was practically negative, except the region of the left ureter and left half of the trigone. Here there was a diffuse edematous process without any evidence of tubercle formation or ulceration, the left ureteral orifice being distorted somewhat in the form of a rosette-like prominence which was apparently composed of edematous mucous membrane. The right ureter being normal, was easily catheterized, clear urine was obtained, indigocarmin appearing in nine minutes. It was impossible, even with small catheters to enter the left ureter any farther than one-half centimeter.

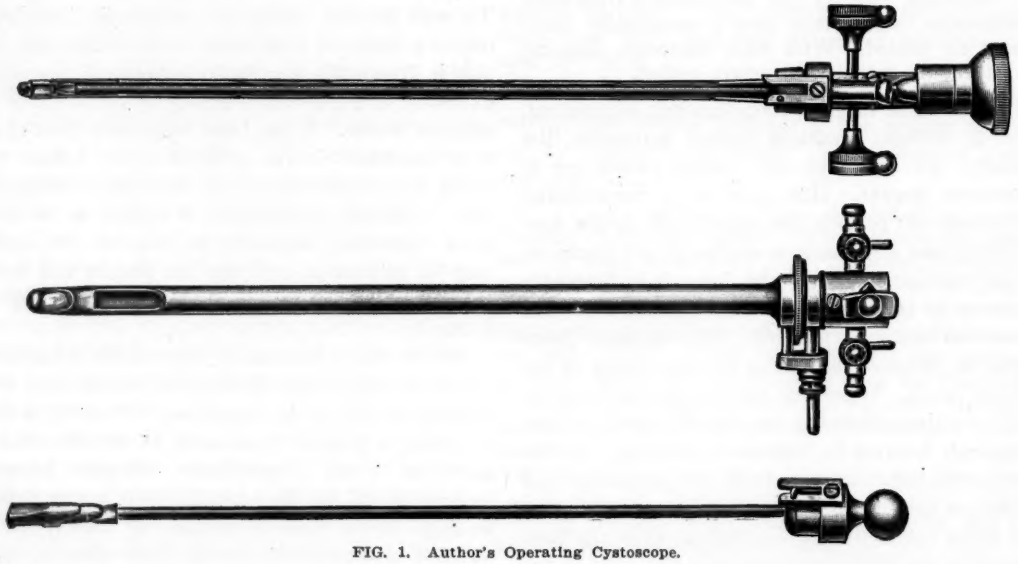

FIG. 1. Author's Operating Cystoscope.

Thus, the findings were apparent closure of the left ureteral orifice, slight edema of the left half of the trigone, normal functionating right kidney.

Therefore, on this day *a presumptive diagnosis of left renal tuberculosis* was made, although the urinary findings *were negative, the urine* was perfectly *clear* and *no tubercle bacilli could be demonstrated.*

During all this time, the urine continued to be clear, and on the 22d of December the patient felt so well that he expressed the desire to go home, because urination occurred only every three hours,

sometimes once at night, at other times, not at all.

Having arrived at a tentative diagnosis of left renal tuberculosis without sufficient facts to make this certain, I determined to apply a method which had given good results in other cases, namely *the excision of bladder mucous membrane,* in order to corroborate the suspicion that the left kidney was the seat of a tuberculous process.

Accordingly on December 24th, a *number of pieces of the edematous left ureteral lip were removed for microscopic diagnosis* by means of the author's operating cystoscope and punch forceps. (Fig 2.)

The microscopic sections, examined on December 26th, showed the unmistakable evidences of tuberculosis, namely *numerous miliary tubercles in the submucous tissues.*

Pathological Examination of Mucous Membrane from the Ureteral Ostium. Two types of tissue were found in the excised pieces; those corresponding to what appears microscopically as edema or *edema bullosum,* and those pieces which combine the edematous lesion with the presence of miliary tubercles.

The edematous areas are of interest since there has been much discussion regarding what really constitutes *edema bullosum.* The microscopic sections show mucous membrane covering an edematous stroma, the mucous membrane thinned out in places, in other places giving evidences of hypertrophy with a tendency to the formation of glands. The stroma is of interest in that it presents an intense edema, the general picture simulating that of the stroma of a chorionic villus (fig. 3)*. Although at first sight, this swollen tissue appears to be scantly provided with vessels, a careful scrutiny with the high power reveals the fact that there are numerous capillaries scattered throughout, although these are for the most part small; only here and there is a larger blood space recognizable. Those vessels near the surface are not infrequently distended with blood, whereas the deeper capillaries are collapsed and compressed. Near the surface, too, there are foci of inflammation, collections of round cells and plasma, the deeper tissues containing only a small number of round and plasma cells, with here and there a polymorphonuclear leucocyte. In some places there are smaller or larger aggregations of lymphoid cells with no evidences of typical tuberculous lesions.

Some sections are of interest not only because of the edema but also because of the presence of villous hypertrophies or excrescences. The structure of these projections does not materially differ from the rest of the edematous mucous membrane. Such villous hypertrophies are particularly seen in those specimens that elsewhere show miliary tubercles. Where such tubercles are present, the edematous stroma in the neighborhood seems to be more rich in cellular elements, there being possibly a proliferation of fixed cells besides the presence of numerous plasma cells.

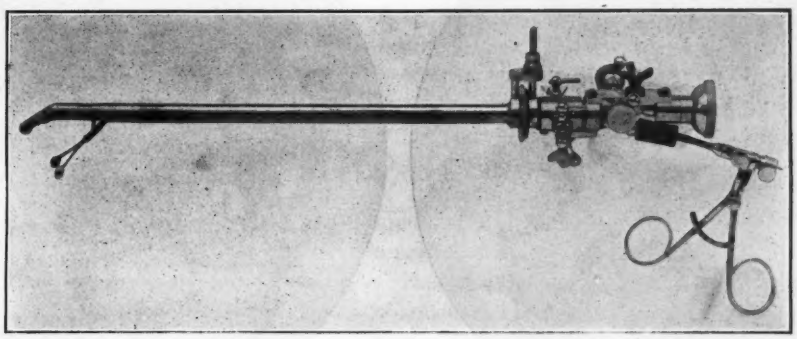

FIG. 2. Author's Operating Cystoscope with Forceps Adjusted.

Separated from the surface by edematous stroma, measuring in thickness at least that of the diameter of a small miliary tubercle, we find, here and there, small typical tuberculous foci (fig. 4).

In such sections as these, *it is not at all surprising that gross appearances do not speak absolutely for tuberculosis,* since the tubercle itself does not make the surface projection. The visual alterations are due to the edema and the villous excrescences of the surface mucous membrane.

In some places, however, larger miliary tubercles —in places, fused tubercles—do approach the surface so close as to be almost in contact with the mucous membrane. Here, one would surmise that tubercles *per se* could be visible through the cystoscope. Consideration of this section, however, showed that such tubercles usually form only part

*I wish to thank Dr. F. S. Mandelbaum, Director of the Pathological Laboratory, Mt. Sinai Hospital, for the photomicrographs.

of the protuberance made by the mucous membrane, the other portion being occupied by edematous stroma and lymphoid cells.

On December 27th, 1912, I performed left lumbar nephrectomy, and the diagnosis was corroborated by the extirpation of a typically tuberculous kidney.

Careful examination of the specimen of kidney and ureter brought out a point of exceedingly great interest from the standpoint of the value of the method of diagnosis under consideration. The kidney was somewhat enlarged and involved by a tuberculous process which was evidently of greatest duration in the substance of the third papilla counting from the superior pole. The apex of this papilla was exulcerated, its parenchyma infiltrated by a tuberculous process in the earliest stage of disintegration. The two superior papillae showed apical tuberculosis, and the cortex corresponding to the three papillae described showed a fair number of disseminated small miliary tubercles. A few scattered tubercles were found elsewhere in the parenchyma. *Most striking, however, was the fact that neither the pelvis of the kidney nor the ureter* (and about 15 cm. of this were removed) *showed any marked degree of tuberculosis.* Indeed, only a few scattered tubercles could be discerned in the pelvis, and the ureter throughout its whole length was almost normal save for slight dilatation and contained all in all no more than 3 or 4 minute tubercles.

The importance of the absence of extensive tuberculous involvement of the ureter and pelvis in this case, *and* the *bearing* of this fact upon the value of the diagnostic method here described, become clear when we bear the following considerations in mind: The case demonstrates in most excellent fashion, the pathological phenomenon of the presence of lesion adequate for diagnosis at the ureteral orifice, with but slight involvement of the pelvis and practically normal ureter. This would indicate that the changes in the vesical orifice of the ureter can occur very early in the course of renal tuberculosis, and it is this localization of the tuberculous process at the vesical ostium where it can be attacked by my punch forceps and operating cystoscope, that makes a positive diagnosis possible early in the disease.

Indeed, before the nephrectomy was done, and from the finding of an impermeable ureter whose lips showed only the lesions of edema without ulceration, it was surmised that extensive disease of the ureter would be found together with extensive renal caseation. To my surprise, however, the incontrovertible fact was brought out that marked focalization of the tuberculous process at the orifice of a ureter can occur with an almost normal ureter and pelvis above.

Space will hardly permit of a discussion as to the reason for this concentration at the ureteric meatus, a subject which will be considered in a future publication. Here it will suffice to conclude that this circumstance is of inestimable value in furthering the diagnosis of renal tuberculosis, not only because visual evidences are afforded, but also by reason of the fact that actual tissue changes are

FIG. 3. Photomicrograph Illustrating Areas of Edema.

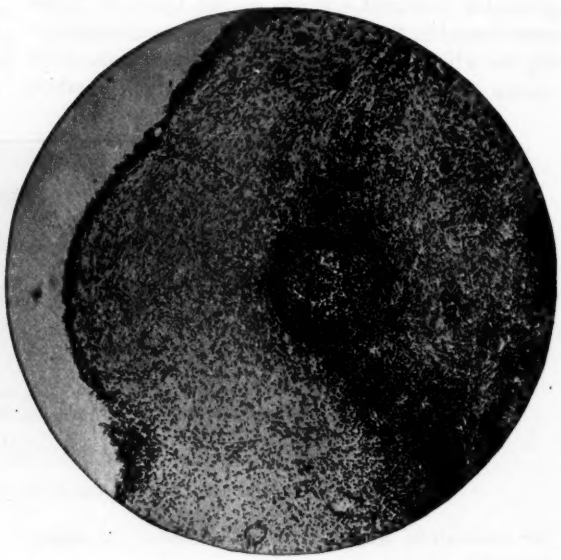

FIG. 4. Area of Edema with a Miliary Tubercle in the Depth.

present which can be demonstrated to exist and recognized as tuberculous by performing endovesical cystoscopic biopsies.

Conclusions:

(1) It has been shown definitely that the excision of mucous membrane of the ureteric meatus may yield tissue containing miliary tubercles, at a time when no positive evidences of tuberculosis of the kidney are at our disposal.

(2) Miliary tubercles may be present in such tissue, although the only visual alterations of the mucous membrane are those which appear as "edema" even to the trained eye.

(3) Such excised pieces make a positive diagnosis possible when the ureteral catheter fails us, when the guinea-pig inoculations are negative, when the urine is perfectly clear and when the patient is presenting practically no symptoms.

(4) Concentration and focalization of the tuberculous process at a ureteric meatus may occur early in the disease.

(5) Such miliary tubercles may be found in the ureteric ostium even though the rest of the ureter is almost free from tuberculous change and when the pelvis of the kidney too, is but slightly affected.

(6) Cystoscopic biopsy should be performed on the ureteric orifice of the affected side, in all cases of suspected renal tuberculosis where the ocular evidences are sufficient to warrant a suspicion of renal involvement; also whenever tubercle bacilli cannot be demonstrated, and, whenever positive evidences of the presence of a tuberculous process in the kidney are lacking.

THE SIGNIFICANCE OF PAIN IN ABDOMINAL DIAGNOSIS.

The pain of rheumatoid arthritis of the vertebral joints affects the nerves leaving the vertebra. This condition may produce a hypersensitiveness of the abdominal wall which has not infrequently been confused with appendicitis. In all of these reflex pains, however, the rigidity, which is partly a voluntary rigidity, yields to continuous pressure. The pain of tabes dorsalis with abdominal crises must also be differentiated.

In herpes zoster of the eleventh and twelfth dorsal nerves and the first and second lumbar nerves, there is a sharp boring pain with an exquisite sensitiveness of the abdominal wall, which must be differentiated from that of a lesion in an underlying organ; but here again continuous pressure causes the rigidity to yield. It has happened that the vesicles which appear in herpes zoster have been mistaken on the third or fourth day for vesicles due to applications to relieve pain.—J. P. WARBASSE, in the *Long Island Medical Journal.*

THE DIAGNOSIS OF FOREIGN BODIES IN THE ALIMENTARY AND RESPIRATORY TRACTS OF CHILDREN.

I. S. HIRSCH, M. D.,
Roentgenologist, Bellevue Hospital,
NEW YORK CITY.

(Continued from the January issue.)

FOREIGN BODIES IN THE BRONCHI.

The symptoms produced by foreign bodies in the bronchi depend both on the degree of interference with the functionating power of the lung and on the severity of irritation of the bronchial wall. Marked occlusion of one of the main bronchi is not compatible with life. Death does not come on suddenly or rapidly but the compensating power of the unaffected lung does not seem to be sufficient to enable the function of aeration to be satisfactorily performed. Obstruction of one of the minor bronchi does not produce such disastrous consequences. This is due to a compensating hypertrophy of the lung. In animals the tying off of one main bronchus results in death, from rupture of the other lung and pneumothorax or from statis of blood in the pulmonary vessels.

In the vast majority of cases after the subsidence of the suffocation paroxysm incidential to the entry of the foreign body, and its impaction within the lumen of one of the secondary bronchi, there comes a period of calm.

The intruding substance seems to be tolerated and no manifestation of pathological changes are evident. Thus such foreign bodies as nails (Collard), coins (Mitchel, Baldwin, Dupuytren), pins, pieces of bone have been found in trachea and bronchi where they had lain for years without giving symptoms.

Bunch and Lake[48] cited 31 cases in which the foreign body was in the trachea or bronchus for intervals from one year to sixty, in all which recovery took place after expulsion or removal.

Symptoms.—The symptoms may be divided into those due to irritation of the lining membrane of the bronchi, and those resulting from interference with the functionating power of the lung. Not in all cases are the manifestations similar. A slight cough, as the only symptom in one case, will contract with severe dyspnea, paroxysmal cough with bloody expectoration in another. Cough is the most constant, severe and persistent symptom. In some cases the paroxysms are frequent and exhausting, and are accompanied by considerable mucus expectoration. Where the foreign substance has been in the bronchus for a long time, large

quantities of frothy blood-tinged fluid may be brought up. This is usually swallowed and then expelled during the vomiting that often follows the severe coughing. In no disease except tuberculosis or pertussis is vomiting and coughing so constantly associated. Hemorrhages may occur. In a case which came under Huber's[49] observation repeated hemorrhages ceased only when an iron nail was coughed up after being in the bronchus for two years. Hoarseness may be an early and persistent symptom. Pain is not common, but when present it is referred in a general way to the chest or upper abdomen.

The respiratory rate is usually increased and either the inspiratory or expiratory phase, frequently the former, may be labored and difficult. The accelerated respiration appears to be rather constantly present even when no other symptoms are evident.

The children are at first very restless, but soon assume a position in which respiration may be carried on most effectively. Huber[50] has called attention to an important test regarding the position of the foreign body. He observed in cases in which the object evidently was not impacted, that the position of the patient would influence the symptoms in a striking and characteristic manner. Distressing coughing paroxysms resulted when the patients were disturbed or placed on the unaffected side; relief was immediate when the original posture was resumed. It appears as though such children instinctively assume a position in which there is least disturbance of the foreign body. When the passage of air into the lung is markedly interfered with, as in obstruction of a large bronchus, there are all the evidences of dyspnea, as the stooping position of the body, the contraction of the auxiliary muscles, the dilatation of the alea nasi, etc. All the accessory muscles may be brought into activity. Cyanosis will depend on the degree of obstruction to the entrance of air. Hoarseness may be present. Fever is, as a rule, not present until the sequela appear. In those cases where the obstruction is not marked the general condition of the child may in no way deviate from the normal.

Physical Examination.—The physical examination of the chest yields data which aid considerably in the establishment of the diagnosis. The signs, however, depend upon the amount of obstruction the foreign body offers to the entrance of air to the lung parenchymea. This does not depend entirely upon the size of the impacted body, for a small rounded body may completely fill the lumen of the tube, while another but larger body, either because of its irregular shape, or because it is perforated, like a whistle or a bead, or a tracheotomy tube may allow the entrance of considerable air.

If the bronchus obstructed be a minor one, examination of the chest may yield no positive data, because the signs which a small area of collapsed lung would give are over-shadowed by compensatory dilatation of the adjacent lung, a process which always takes place in greater or lesser degree.

When obstruction of one of the larger bronchi occurs, depending upon the site and degree of obstruction, there will be dullness, diminution of tactile fremitus, with diminution or absence of vesicular murmur and limitation of chest movement. The compensatory dilatation about the collapsed area of lung tissue obliterates the signs obtainable by percussion of a greater degree than those obtainable by ausculation, so that normal resonance with absence of vesicular murmur associated with other essential data, is strongly suggestive of the presence of a foreign body in one of the bronchi.

In addition to the diminution of its intensity, the pitch of the respiratory murmur may be so raised as to acquire a sibilant quality. This is due to the passage of the air current through the obstructed bronchus and though in some cases it is not present at first, it becomes evident later as a result of further narrowing by the swelling of the mucous membrane at site of the impaction. The respiratory murmur may be simply coarse and noisy. In one case where the foreign body was a reed whistle, the whistling sound of this instrument was heard. In a girl who aspirated such a whistle into her right bronchus, Angleis states that the whistling sound produced by the rushing of the air current could be heard at a distance of 15 meters from the chest. As soon as inflammation of the mucous membrane is set up, loud subcrepitant rales will be heard over a localized area.

As has been mentioned when the foreign body is such as is capable of swelling in the presence of fluids, the symptoms following the initial paroxysm are exceedingly severe, persistent and grow progressively worse. This is due not only to the marked obstruction caused, but also because of the pressure exerted upon the bronchial wall. The suffocative paroxysms come on suddenly. In Kellock's case the initial paroxysm lasted 20 minutes after the inspiration of a bean. After being with-

out symptoms for about 15 hours, the child began to suffer from severe pains in the chest; there was lividity, cyanosis, dyspnea and severe coughing. Examinations of the chest showed signs of deficient expansion, impaired resonance, feeble respiratory murmur and moist rales over the entire left lung indicating obstruction of the left main bronchus. The foreign body was removed through a low tracheotomy wound. Compared [54] reported the case of a boy seven years who aspirated a piece of husk. Intense suffocation and severe incessant

FIG. 13.—Case XII. Tack in larynx.

cough followed, then fever, chills and pains in left chest. The cough grew worse and was accompanied by, first, sanguineous, then purulent and finally fetid expectoration. The diagnosis of large abcess at left base was made. The *x*-ray examination failed to show the foreign body. Bronchoscopy was done with difficulty because of enormous quantities of fetid pus, but during the examination the husk was found obstructing the lumen of the examining instrument. However, in some instances the severe symptoms due to foreign bodies of this nature after reaching a climax may gradually subside, either because of disintegration or absorbtion. Thus in a case reported by Clayton[55] a boy of 12 years suffered severely from chills, fever and cough with hemoptysis, because of obstruction of one of the main bronchi in the right lung by a peanut. There was gradual recovery, however, due to disintegration of the foreign substance and expulsion of the fragments by coughing..

In concluding the consideration of the primary symptoms and signs it cannot be too strongly emphasized that in many cases they are singularly mild and few, particularly in the early history of the condition. The exception is in the class of cases just narrated. Frequently even though the early period be stormy, the symptoms gradually abate so

FIG. 14.—Case XIII. Nail in left bronchus.

that a state of comparative comfort is soon reached, which continues to exist for a long time. Even with a portion of the lung atelectatic the only symptoms may be a mild cough. The confusion and difficulty in the establishment of the correct diagnosis that this may cause has already been dwelt upon.

Tolerance.—The bronchi tolerate the presence of a foreign body under conditions already stated. The extent of this period of tolerance, as well as the intensity and severity of the pathological process which succeeds it, depends to a greater extent upon the nature of the impacted substance and its location than upon the resistance of the organism. Septic organic objects will produce an inflammatory process more rapidly than an aseptic inorganic one. A non-septic foreign body may lie within the lung

for an indefinite period and produce no inflammatory changes.

When the inciting cause for the inflammatory process is an infective agent introduced with the foreign substance, a bronchopneumonia inflammation appears early, in some cases at the end of 24 hours. Otherwise the ulceration which later results from the pressure of the impacted body is the starting point of the inflammatory process. As this ulceration depends upon the position of the intruding substance within the bronchus, it is apparent that in those cases where its position is such that no pressure is brought to bear upon the mucous membrane, and no interference with its circulation

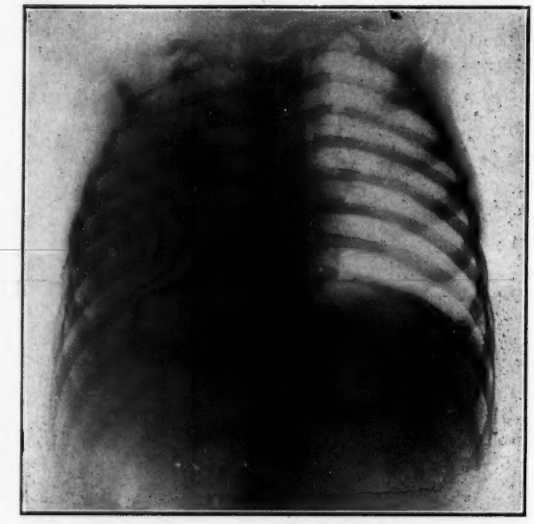

FIG. 15.—Case XIV. Collar-button in left bronchus.

place, the pathological lung changes may be delayed for an indefinite period.

Pathology.—Following the occlusion of a bronchus by a foreign body, compensatory dilatation of not only the adjacent but also the distant lung parenchymea occurs to a greater or less degree with the production of vicarious emphyema. This is due not only to the yielding of the alveoli but also to the yielding of the bronchioles and smaller bronchi.

If the obstruction is incomplete, during inspiration the air passes through narrowed part and distends the bronchi and fills the air spaces, but the expulsion of air is prevented by the plugging of the tube by inflammatory products, which act as ball-valves and thus the expiratory effort is spent in stretching the walls of the tubes. The inflammatory process set up by the foreign body further weakens the wall of the bronchus (as Stokes has pointed out, the inflammation of the mucous membrane paralyzes the subjacent muscular layers so that the tonicity of the elastic muscular fibers is lost), and it thus offers no resistance to the increased introbronchial pressure resulting from the expiratory efforts and from the coughing spasms associated with the condition. When the obstruction of the bronchus is complete, collapse of the portion of the lung, which it supplies, occurs. The circulation of the blood in this atelectatic lobule is, however, still maintained, and when by direct extension the inflammatory process initiated at the site of impaction reaches this atelectatic area the secretions accumulate and bronchiectasis finally results. Lichtheim has shown, experimentally, that this bronchiectasis is a direct result of the inflammatory process within a partially atelectatic lung. If no inflammation results there is no such dilatation and the air is absorbed. In the animal experiment of Lichtheim absorption was complete in 24 hours.

At first localized the process soon extends to the air spaces surrounding the affected bronchus, producing all the essential pathological changes of a bronchopneumonia, namely, the inflammation of the mucous membrane, the consolidation of areas of lung tissue, the diffuse bronchiectasis, the plastic or exudative pleurisy and the areas of atelectasis, all being reproduced. This pneumonia does not usually resolve but goes as an interstitial process with or without abscess formation. According to Tuffier[51] abscess occurs in 11 per cent. of the cases. It occurred in 29 per cent. of Wood's 89 cases. The abscess cavity may be in communication with a bronchus from the beginning, or it may affect a connection by perforation and the impacted substance loosened by purulent inflammation may be expelled during coughing.

There is a peculiar liability to gangrenous degeneration of the inflammatory products of a secondary bronchopneumonia due to foreign bodies. The gangrenous process eventually may extend to a lung previously unaffected by inflammation. In this gangrene, in addition to gangrenous odor of breath, and fetid expectoration which contains necrotic lung tissue, there may be another characteristic symptom—hemorrhage. This, according to Rilliet and Barthez, is present in about one-quarter of the cases and may be fatal. The inflammatory condition of the pleura may result in empyema or this may be brought about by the perforation of a lung abscess, with the extrusion of the foreign sub-

stance into the pleura. A case has been reported where, during a post-mortem examination, a foreign body was found in an empyema 13 years after aspiration.

The perforative process may cause pneumothorax. This condition has, however, been reported as having occurred early, due to the strain upon the unaffected lung by violent coughing efforts resulting from the impaction of a foreign body. This complication is rare. As a rule it is first abscess formation, then rupture of abscess, with pyopneumothorax. Ast[56] reported a case of a girl four years old who aspirated a pebble. There was an adhesive pleurisy with severe bronchopneumonia, and on the eleventh day perforation with pneumothorax.

Secondary Symptoms.—The secondary symptoms are to be considered as being those due to sequela or complication of the presence of a foreign body. The striking features, whatever the symptom-complex presented, are the paroxysmal cough followed by vomiting, the evidence of chronic dyspnea, the extreme chronicity of the condition, associated with frequent attacks of acute pneumonic inflammations.

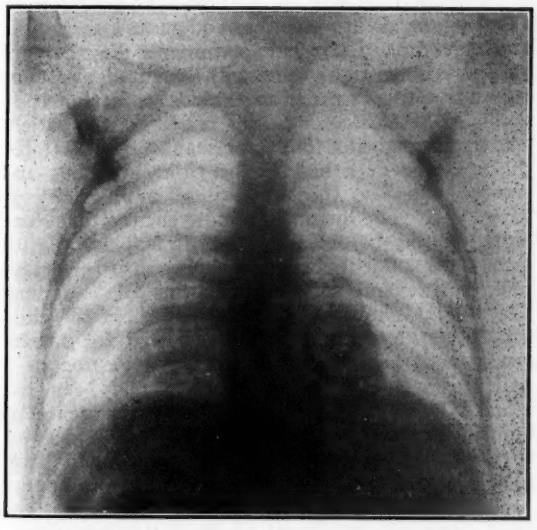

FIG. 16.—Case XV. Blunt screw in bronchus of right lower lobe.

Restitution.—After the removal of a foreign body the signs within the chest clear up with remarkable rapidity. This has been commented upon by many observers.

Not only is this true of the early lesions but even in cases of long duration, the well marked pathological changes recede rapidly and the restitution of the lung to normal condition is almost complete. Thus such remote changes as the curvature of the spine, clubbing of fingers, all disappear. The cicatrization of productive inflammatory tissue does not to any extent impair the functional power of the lung. These changes are perhaps apparent only by Röentgen ray examination.

As serving to illustrate the difficulties which arise in the diagnosis of foreign substances in different parts of the bronchial system, the following cases are cited:

1. There are a class of cases in which the history of entry may be entirely absent. The etiological factor is only accidently discovered in the study of a secondary condition which is not considered to have any relation to the presence of a foreign body.

CASE XIII. Vincent M., age 5 years, was admitted to the Children's Service of Bellevue Hospital in the service of Dr. Howland, with the following history:

One and one-half years before the child became ill with pneumonia, and was ill for sixteen weeks. The cough, which had been severe during this illness, then ceased for two weeks. From that time on, however, he has had more or less constant paroxysmal cough which is very frequently followed by vomiting. He is feverish towards evening. There have been no night sweats.

Physical examination showed a normally built child, breathing rapidly, but without any apparent dyspnea. The respiratory movements on the left side were somewhat restricted. The right lung was clear of signs. On the left side there was a marked dullness, both anterior and posterior, the note becoming flat at base. The vocal fremitus was increased. Except for a small area above the second rib in front and fourth rib behind the breathing was everywhere bronchial with a few crepitant and subcrepitant rales. P. 120, resp. 36.

The blood showed 18,000 leucocytes, 78 polynuclear, 14 large mono and 8 small mononuclear.

The diagnosis of a probable abscess of the lung was made. The radiograph (Fig. 14) showed the presence of a nail in one of the bronchi in the lower lobe of the left lung. The entire lung, except for a small area at the apex, was densely infiltrated. The heart was not displaced. The other lung showed evidence of compensatory emphysema. With these findings in evidence the parents were questioned as to the history of the ingestion of such a substance. They then recollected that about two years previously the child had swallowed a nail and that a physician had been consulted, but since the accident was followed by no discomfort, nothing was done. When several months later the pneumonia appeared, the history of the ingestion of the foreign body was not considered to have any bearing upon the condition. Operative interference was refused and the child left the hospital. There were several attacks of pneumonia, and four years after its inspiration the child died with the foreign body not removed.

CASE XIV. S. P., age 5 years, was admitted to the Children's Service of Dr. LeFetra in Bellevue Hospital with the history of having been ill for five weeks with cough and fever, the latter symptom being present mostly at night. The coughing was severe and frequently followed by vomiting.

Physical examination showed a well developed and well nourished child. There was fullness of the left side of the chest with some diminution of expansion. There was dullness over the left chest posteriorly and in the axilla from the spine of the scapula to base. The breathing was of the bronchial type, though diminished and distant. Fine crackling and coarse rales were present. The heart was not displaced. The chest was tapped, but no fluid was obtained. The clinical diagnosis rested between an encysted empyema and an abscess of the lung.

The radiographic examination (Fig. 15) disclosed the presence of a collar button in the left bronchus just beyond the bifurcation. The central portion of the middle and lower lobes showed considerable infiltration.

The foreign body was removed by Dr. S. Yankauer by bronchoscopy.

CASE XV. Max W., 5½ years, gave a history of paroxysmal cough followed by vomiting for three years. This had been diagnosed as whooping cough and asthma, and the child was treated for these diseases. Six months after onset of coughing he developed pneumonia and was ill twenty-one days. Two weeks later had another pneumonia. On the eighth day of the illness the child was sent to a hospital where the diagnosis of pleural effusion was made, but thoracentesis resulted negatively. The child improved slowly and left the hospital with a severe cough accompanied by bloody sputum and occasionally followed by vomiting. He lost flesh and strength rapidly. Several weeks later he was again admitted to the hospital with the diagnosis of relapsing pneumonia. The cough persisted for nine days even after the temperature was low. The patient was then radiographed and a screw was found in the right lung at a point about opposite the seventh rib. An attempt was made at bronchoscopy, but it was not successful. He left the hospital in two weeks and was comparatively well up to July, 1911, but still had slight cough and occasionally coughed up blood. This gradually became worse, the expectoration becoming foul smelling and purulent. There was slight temperature in the afternoon.

Physical examination shows dullness at the right base and near the spine of an area over which there was bronchial breathing and rales.

The *x*-ray examination at this time still showed the screw, point down near the eighth rib posteriorly. The child had been bronchoscoped several times and attempts had been made to remove the screw, but were unsuccessful. The foreign body had gradually moved downward in the bronchus and now lies in one of the secondary bronchi in the posterior portion of the right lower lobe, about opposite ninth rib (Fig. 16). Of late the child has been gaining weight and looks well, but coughs at times severely and vomits almost daily after coughing. No blood expectoration is present.

For the history of the above case I am indebted to my associate, Dr. I. Landsman, through whose courtesy I was permitted to examine and study the case.

CASE XVI.—Isadore B., aged 2½ years, was admitted to Beth Israel Hospital in the service of Dr. F. Huber, with the following history:

Six months before admission the child had measles and pneumonia. From that time on, there has been more or less continuous cough, which has gradually grown worse, the paroxysms becoming frequent, very severe and associated with much dyspnea. Four weeks before admission the child became ill with chills, fever and rapid breathing. The severe coughing paroxysms were accompanied by purulent expectoration and frequently followed by vomiting. There was no hemoptysis. The child's condition gradually grew worse, the expectoration became fetid, there was considerable sweating, marked prostation, and great loss of flesh and strength. Upon admission the diagnosis of abscess of the right lung with localized gangrene was made and in order to exclude a foreign body as the causative factor of this condition, the patient was radiographed. The examination demonstrated the presence of a nail in the right bronchus and trachea and also the presence of a lung abscess (Fig. 17). The history was now elicited that some eight months before the child while playing with some nails suddenly began to choke, gasp for breath and had several severe paroxysms of coughing. The urgent symptoms soon subsided, but the child was left with a cough which persisted for several weeks and then disappeared. The ingestion of a nail was suspected, and the child had been examined by several physicians, but the absence of any further symptoms had allayed the anxiety of the mother and this entire occurrence had completely passed out of her mind and did not appear to her nor to those under whose observation the child came for treatment of its pulmonary condition, to have any bearing upon the child's condition. The nail was removed through a tracheotomy wound. The abscess of the lung was treated in the usual way, and though tedious, the recovery of the child was complete.

CASE XVII. Jacob M., 9 years of age, nativity Russia, was admitted to Dr. F. Huber's service at Beth Israel Hospital, with the following indefinite history:

With the exception of measles as an infant, he had enjoyed fair health up the present illness. For the past five weeks the boy had gradually lost flesh and strength. He suffered from paroxysms of coughing attended with the muco-purulent expectorations and followed by vomiting. No night sweats or hemorrhages. Occasionally he complained of chilly feelings, but no fever, with the exception of a period of three or four days, two days after the onset of his illness. The appetite was poor and pulse and temperature were normal.

Physical examination revealed retraction of the infraclavicular region on the right side with diminished expansion. The right anterior aspect of the chest was flattened. On percussion there was marked dullness over second, third and fourth interspaces anteriorly, apex not being involved. The breathing was diminished and on deep inspiration fine rales were heard over the dull area.

The *x*-ray examination I made revealed a dense infiltration of the upper right lobe; compensatory emphysema of the base. Enlarged glands were visible, at the root. In the midst of the consolidated area, apparently lodged in the right primary bronchus, a tack, about three-quarters of an inch long, was detected (Fig. 18).

In the light of these findings, a careful questioning elicited the following points:

Five weeks before admission, the child accidentally swallowed a brass tack. Almost immediately he was taken with a severe coughing spell, which lasted for several minutes, the attack was not attended, however, with any evidence of asphyxia. Fearing punishment, he had failed to tell his parents about the accident.

The tack was removed by forceps directly through a tracheotomy wound, under direct vision by means of fluoroscope, a method I believe far superior, in some cases, to bronchoscopy.

In the five cases cited there was no history of ingestion, and cases was first observed when secondary symptoms, due to the long retention of the foreign substance, were present.

The problem of diagnosis in these cases is difficult, but it is usually solved when that mental attitude is reached which suggests a radiographic or intrascopic examination. A history of paroxysmal cough extending over a long period of time gradually increasing in severity and later accompanied by chills and fever; the cough associated with profuse expectoration which becomes purulent and then putrid, progressive emaciation and weakness; in other words, a progressive interstitial pneumonia with its sequela and complications is not commonly considered to bear any causative relation to the presence of a foreign body in the bronchi. Yet by keen analysis of the subjective and objective data and the careful exclusion of such other causes as might give the clinical picture, the diagnosis of foreign body may be made even in the absence of a history entry and before the corroborative aid of *x*-ray examination has been given. This was done in a case coming under the care of Dr. F. Huber. In one case a child 21 months was presented in a septic bronchopneumonia and localized gangrene. The story was elicited that five months previously the child while sitting on the floor, suddenly had an attack of suffocation which soon passed away but left the child with a paroxysmal cough. Based upon this story and the objective findings, the diagnosis of foreign body in the bronchus was made which the radiograph proved to be correct, disclosing a bent nail in the left bronchus.

A diagnosis is not, however, always made. Fatal cases are not uncommon, though less frequent in these days than they were formerly, in which foreign bodies have been found in pulmonary abscess where no suspicion of their presence existed during the life of the patient. Two interesting cases of this sort were reported by Bayer[57]. In one a molar of the first dentition was found in a fatal case of abscess of the right lung and in another case the pulmonary condition was due to a sequestra from syphilitic disease of the palate.

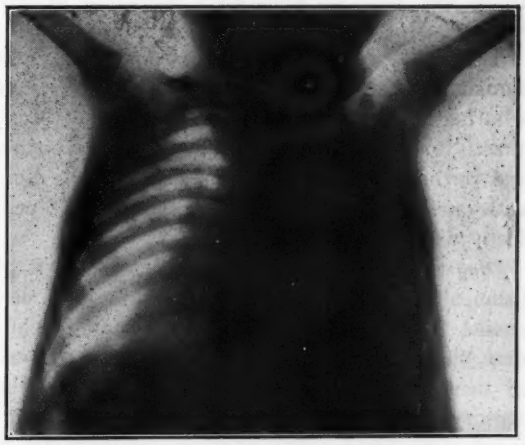

FIG. 17.—Case XVI. Nail in right bronchus and trachea abscess of lung.

2. There are a class of cases in which the history of entry is clear but the mildness of the early symptoms leads to the erroneous diagnosis of a foreign body in the alimentary tract, the true nature of the condition being discovered when seeking the cause of the retention of the substance within the organism.

CASE XVIII. Hattie H., aged 7 years, was referred to me by Dr. Israel Strauss, with the object of locating the exact position of a pin which the child was supposed to have swallowed.

The history was that five days ago, the child, while holding the pin in her mouth and pursuing another child, suddenly stopped and cried out that she had swallowed the pin. She coughed a little at first, but in a few hours the cough ceased and the child was in every way comfortable. There was no change of voice, no dyspnea, nor any difficulty in deglutition. The treatment was based upon the assumption that the pin had been swallowed,

but the carefully watched stools did not reveal its presence.

The case seemed clear. The only doubtful point being the exact location of the foreign body in the alimentary tract. Radiographic examination (Fig. 19) showed the pin in one of the secondary bronchi of the posterior part of the right lower lobe. Examination of the chest at this time showed a normal percussion note over both lungs anteriorly and posteriorly. At the right base inspiration was diminished in intensity, high pitched with a musical quality. There were no rales and tactile fremitus was unchanged. The child was admitted to Mt. Sinai Hospital and six days after the accident the removal of the pin was attempted by means of lower trachecbronchoscopy, but the efforts were unsuccessful. The child recovered from the pneumonia which folowed, the traches wound healed, and four years after its entry the pin is still in the bronchus. The child is at the present time perfectly well with no pulmonary symptoms of any kind.

Tillman reported a case whose outcome was similar to this, the patient being a girl of five years who had aspirated a brass tack into the left bronchus. Removal by bronchoscopy was impossible and further operative measures were refused. Notwithstanding this, however, the child remained perfectly well.

Diagnosis.—The value of the history in the establishment of the diagnosis has already been discussed. Though the subjective examination of children yields but little accurate information because of their inability to definitely locate and describe sensory impressions, it is nevertheless important to weigh any evidence submitted. The story of a spasm of suffocation may give a clue to the establishment of the etiological factor of an obscure intestinal or pulmonary condition. The symptoms which are mild in the majority of cases are none of them pathognomonic, and the objective examination is therefore essential in order not only to verify or exclude the tentative diagnosis but also to obtain accurate and detailed information regarding location, position, etc., of the foreign substance, when it is definitely known to be present in the organism.

Examination of the Pharynx.—The necessity of the examination of the pharynx by direct view with the aid of a tongue spatula and in good light need not be emphasized. The tongue should not only be depressed but pulled forward as well. As illustrating the importance of this examination is the case reported by White[52] in which a pin lay in the throat of a child 18 months for eight months. The throat had been repeatedly examined by others and nothing found. White by depressing and pulling the tongue forward found the pin lying across the pharynx just behind the tonsils.

Exploration.—Examination by direct touch of pharynx and upper air passages is not only of but little value because of the limited reach of the finger and the probability of mistaking normal structures for foreign substances but is fraught with much danger because of the possibility of displacing the substance by blind manipulation. A body resting in the glosso-epiglottic fossa, from whence its removal is a simple matter, may, during such an examination, be pushed into the larynx or esophagus. The posterior pillar of the fauces has been mistaken for a fish bone. Atlee[53] quotes Nelaton who confessed that after pushing deeply into the pharynx in search for a foreign substance he felt a small resisting body and made several attempts to seize it with forceps before discovering it to be the great horn of the hyoid bone.

A rectal examination should always be made when it is known that the body is in the intestinal tract and has not made its expected appearance in the stools. Such bodies are often found lying just above the sphincter and may frequently give no symptoms until their attempted expulsion. A boy of six years appeared in the clinic complaining of pain during defecation, with the story that the stools were usually flecked with bright blood. Rectal examination disclosed a pin with its point imbedded in the rectal wall near the anal margin. There was no history of the ingestion of the pin nor of any symptoms at any time previously. Too extensive manipulation blindly with the finger is here as elsewhere not a commendable procedure, and where the body is found fixed it is best to use a small speculum for further examination and extraction.

The examination of the esophagus by indirect touch with bougies and stilets, for the determination of the existence and consistency of the foreign body is, under the most favorable circumstances, a crude method and frequently gives erroneous results. Previous to the time when direct view of the lumen of the tube could be obtained either by the *x*-ray or intrascopic examination, sole reliance was placed upon these methods of exploration and considerable ingenuity was expended upon the production of instruments for this purpose. This method of examination seldom gives reliable or satisfactory results, for it is an established fact that a bougie will touch a foreign body impacted in the esophagus without sending any appreciable message to the finger or passing to one side of the tube will not

betray its presence if the body does not markedly occlude the lumen. Even under anesthesia this examination does not give any more accurate information. Should it disclose the site of obstruction, it gives no information as to other important factors regarding the impacted body. So that this method, possessing all the defects of blind instrumentation, had best be abandoned and main reliance placed upon those methods of examination which enable us to obtain a direct view of the foreign substance.

The examination of the esophagus by direct view by means of straight tubes inserted into its lumen is a very useful and satisfactory method. The tubes most commonly employed in the examination of children are those of Killian, Rosenheim or Jackson, and for their successful use in general anesthesia is necessary. With these instruments

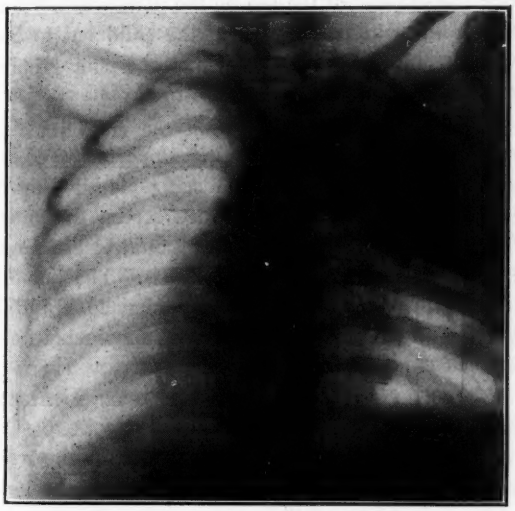

FIG. 18.—Case XVII. Jack in right bronchus.

the esophagus can be searched throughout its entire length and the situation, position, shape and size of the impacted body determined.

The autoscope devised by Kirstein and the pharyngoscope of Hays, has been used for the supplementary examination of the pharynx and larynx. With these instruments a direct view of the pharynx, larynx, particularly the posterior wall, the interaenoid space, and at times the trachea and the beginning of the bronchi, may be obtained. The one objection to the Kirstein instrument is that the patient is held in a constrained position and the examiner is able to see only in the direct line of the instrument itself.

Examination of the Air Passages.—The examination of the larynx in children by means of indirect laryngoscopy is a difficult and usually impossible procedure without anesthesia. More satisfactory results are obtained by a direct view either by means of a spatula, or through a straight tube under general anesthesia with the patient in the Boyce position. Sometimes the actual introduction of the tube within the larynx is not necessary; simple pressure on the base of the tongue or on the laryngeal surface of the epiglottis with the tube spatula will disclose a view both of larynx and upper trachea.

When severe dyspnea is present laryngeal examination should not be attempted unless tracheotomy is previously done. For the examination of the trachea and bronchi the bronchoscope may be introduced, either by being passed through the

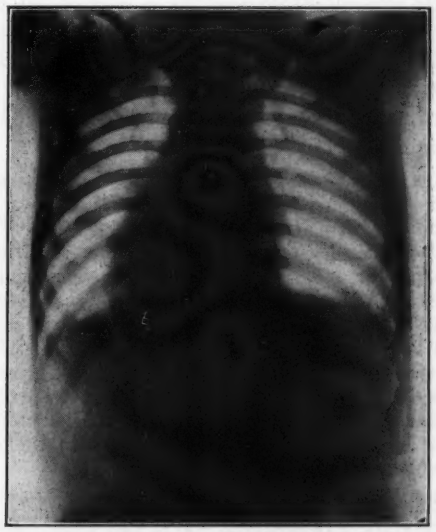

FIG. 19.—Pin in secondary bronchus, right lower lobe.

larynx and trachea, superior trachea-bronchoscopy or through a tracheotomy wound inferior bronchoscopy. The previous localization of the body by the ray facilitates the examination by permitting the choice of instruments and method of introduction. Even in expert hands bronchoscopy does not appear to be an easy procedure. The small caliber of the bronchial tubes, particularly in children under four; the instability of the landmarks, particularly in a lung, in which the foreign body has been long resident; the constant movement of the entire bronchial tree, especially during the ever-present coughing; the flooding of the small bronchi with secretion, all tend to make the search with this instrument difficult, particularly if there are patho-

logical lung changes. In cases where the foreign body has been long resident it is frequently impossible even to get a satisfactory view of the foreign body. Numerous cases have been reported in which the foreign body was expelled long after the futile bronchoscopic attempts at inspection or removal had been made.

The procedure is not without its dangers, particularly in younger children or in children with exudative diathesis. Kümmel reports four cases in which direct bronchoscopy led to serious complications, with a fatal outcome in one case. Two of the patient's were boys of four and a half, the others a girl of nine and a boy of 12. In all there was a subglottic swelling which rapidly increased after bronchoscopy or developed first after it, inducing suffocation which would have proved rapidly fatal in all without the immediate tracheotomy. Even if small tubes are used this danger may be reduced but not abolished entirely. Even when practised through a tracheotomy wound this procedure is not without its dangers, as in the following case:

CASE XIX. G. C., age 3 years, was examined because of a history of having swallowed a tack five days ago. The child did not look ill. There was no difficulty in swallowing. The respirations were rapid, short and grunting. The physical examination was negative except for a small area of dullness at the angle of right scapula with diminished breathing.

A radiograph showed a tack in the right bronchus and a basal pneumonia. After a low tracheotomy a bronchoscope was passed. During the manipulation before the foreign body was seen the child suddenly grew cyanotic and died.

Examination with the Röentgen Ray.—The radiographic examination plays, and must continue to play, an important part in the determination of the presence of a foreign body in the organism. It should be understood, however, that though it has considerable value as a diagnostic agent and has certain advantages in the ease and facility with which the examination is made, this method also has its limitations. There are some foreign bodies which will escape detection if this be the only examination made. In the great majority of cases, however, it allows the detection of the foreign substance and permits the study of the progress of the condition. It permits the study of the movement of a foreign substance and aids in the determination of the measures to be pursued for its extraction.

Technic.—Whether the patients are to be fluoroscoped or radiographed it is important that they be stripped of every vestige of clothing. The examination should not be made in bed but upon a table suited for such examinations. These precautions may seem of trivial importance but they are very essential and many curious errors have arisen from failure to observe them. Rotch spoke of a child who was supposed to have swallowed a pin. In radiographing the child a little flannel band about its abdomen was not removed. The picture showed the pin and preparations for operation were made, but when the child was bathed it was found that the pin had not been swallowed but had slipped behind the band. A metallic substance lying behind the sensitive plate subjected to exposure will give a faint shadow and be mistaken for a body within the organism. A child supposed to have swallowed a safety-pin was radiographed and the picture showed a faint but distinct shadow of the pin evidently in the intestine. Later it was found that the shadow of the pin on the plate was not due to the one within the body of the child but to one which lay in the sheet upon which the photographic plate had been put during exposure.

For fluoroscopic examination the child may be either in the erect posture, being supported on either side or lying prone, the tube being placed beneath the table. With open or shaded screen the entire body from occiput to symphasis should be examined irrespective of the clinical diagnosis. The liability to erroneous diagnosis will be minimized if radiographs are made even when the fluoroscopic examination is considered satisfactory.

With the suitable apparatus and a large current it is possible to make radiographs with an exposure of a fraction of a second, and during this short interval even the most restless children may be kept quiet. A child usually very uneasy will often lie perfectly quiet the instant the tube lights up, being evidently fascinated by the glowing bulb. In many thousand radiographs made for this and other conditions, I have never found it necessary to administer an anesthetic in order to obtain satisfactory pictures. The neck, chest and abdomen should be radiographed if the body has not been previously localized with the fluoroscope.

The vast majority of the foreign substances which give trouble within the alimentary or respiratory passages of the child will cast a definable shadow upon the photographic plate if the exposure be correctly made. Occasionally a soft or thin substance in the esophagus will cast a shadow which may be lost in that of the spinal column. In those cases a radiograph made with the patient in the oblique

position will throw the shadow of the esophagus away from the column and an impression of such a substance will be obtained which would otherwise not be recognizable. The dried plate placed within an illuminating box where it is possible to vary the intensity of the light, should be examined with great care and thoroughness with the eye in not too close proximity of it.

The skill required for the accurate interpretation of an *x*-ray plate can be obtained only from the extensive reading of such plates, normal and pathological. The actual making of the radiograph is comparatively simple and is after all only the means to an end and that is its interpretation. Every impression upon the plate is a shadow, true or distorted of some structure of or in the body and is capable of interpretation as such. A foreign body like a pin in the intestine, and thus at some distance from the photographic plate, will not only cast a distorted shadow but because of the peristaltic movement of the gut, the impression upon the plate will be hazy and indistinct as well, unless the exposure be short. The shadow of a disc-like foreign substance may appear upon the plate as a mere line. In a case of a boy of 10 years, who had inspired a prune pit, the radiographic examination in several hospitals failed to show the shadow of this, which was, however, well defined in a plate made later.

In another case where I was able to obtain a distinct shadow of a linear foreign substance (evidently wood) in a child suffering from interstitial pneumonia, operative measures were refused because an examination made elsewhere, and made improperly, did not disclose any shadow.

No difficulty will be experienced as a rule in deciding from the radiograph whether the foreign body is in the trachea or esophagus. If such doubt exists the matter can be easily cleared up by a radiograph made in the lateral or oblique position or stereoscopically. A knowledge of the topography of the bronchi, according to their projection upon the radiographic plate, will materially assist in the extraction with the bronchoscope. Reference to stereoscopic pictures made with the bronchi of a cadaver injected with bismuth may aid in the localization of the foreign body and in the estimation of its position in the bronchial system.

Finally it must be emphasized that the examination with the Röentgen ray, using short exposures, is a harmless procedure. That the rays have a profound effect upon metabolism is not to be doubted, and yet after radiographing thousands of children suffering from every sort of a pathological condition, detrimental effects which by the most liberal interpretation could be ascribed to the examination are as yet to be demonstrated.

REFERENCES.

[1] WILLARD: *Journal A. M. A.*, October 26, '01.
[2] RIGBY: *Annals of Surgery*, March, '06.
[3] MAYO: *Northwestern Lancet*, March, '97.
[4] BRONNER: *Northwestern Lancet*, May 6, '99.
[5] RECTENWALD: *N. Y. Med. Jour.*, January 13, '06.
[6] MACINTYRE: *British Med. Jour.*, August 12, '06.
[7] KALLIONZIS: *British Soc. de Chir. de Paris*, 1907.
[8] FULLERTON: *British Med. Jour.*, May 17, '04
[9] JALAGUIER: *Bull. et Mem. Soc. de Chir. de Paris*, 1907.
[10] HALSTEAD: *N. Y. State Med. Jour.*, July, 1908.
[11] BALDWIN: *Phil. Med. News*, 1871.
[12] ROSENTHAL: *Weiner Halle*, 1862.
[13] MARSHALL: *Northwestern Lancet*, February 4, '05.
[14] HEATON: *British Med. Jour.*, June 4, '98.
[15] HAWLEY: *British Med. Jour.*, March 12, '98.
[16] ROLLESTON AND WHIPHAM: *Lancet*, February 11, '05.
[17] HUBBELL: *Journal A. M. A.*, April 10, '09.
[18] BRUCH: *Bull. Med.*, Paris, 1903.
[19] MAYO-ROBSON: *Lancet*, November 3, '94.
[20] LUCAS: Report of the Society of the Study of Diseases of Children, London, 1900-01.
[21] BLEISNER: *Med. Woch. Münch.*, February 26, 1900.
[22] T. C. ENGLISH: *Lancet*, November 25, '05.
[23] RUDIS JICINSKY: *Med. News*, October 5, '01.
[24] PARKS: *Journal A. M. A.*, June 5, '09.
[25] DUPONT: *Gaz. de Hosp.*, Paris, 1903.
[26] HALL: Trans. Southern Surg. and Gynec. Assn., 1905.
[27] LITTIG: *Journal A. M. A.*, November 25, '05.
[28] CLEMSON: *Journal A. M. A.*, January 13, '06.
[29] OWENS: *Med. Record*, 1887, Vol. 31.
[30] SOLOMENS: *Pediatrics*, 1898, page 295.
[31] RODGERS: *Journal A. M. A.*, January 13, '06.
[32] MOULIN: *Lancet*, May 9, '96.
[33] MENRACHER: *Münch. Med. Woch.*, December 25, '06.
[34] GLAZEBROOK: *N. Y. Med. Jour.*, March 11, '05.
[35] KELLOCK: *Lancet*, November 15, '02.
[36] MACKAY: *Intercoll. Jour. Med.*, Australia, 1903, 18-226.
[37] CRILE: Surgery Respiratory System.
[38] NAISMITH: *British Med. Jour.*, June, 1887.
[39] BROWN: Journal Minnesota National Assn., 1905.
[40] MORRIS: *Journal Surg., Gyne. and Obstet.*, May, 1910.
[41] ROSE: *Lancet*, 1843.
[42] TILLMAN: Trans. Medical Society.
[43] PATTERSON: *British Med. Jour.*, August 12, '06.
[44] ROSENHEIM: *Laryngoscope*, June, 1907.
[45] ZIA NOURY: *Arch. Internal de Laryngo.*, 1905.
[46] GAREL: *Lyon. Med.*, February 4, '96.
[47] JACKSON: *Laryngoscope*, Vol. 15, 1905, page 257.
[48] BUNCH AND LAKE: *Lancet*, 1897.
[49] HUBER: *Phila. Med. Jour.*, May 3, '02.
[50] HUBER: *Surg., Gyne. and Obstet.*, May, 1910.
[51] TUFFIER: *Soc. de Biolog.*, November 21, 1906.
[52] WHITE: *Medical Record*, April, '88.
[53] ATLEE: *Medical Record*, April, '89.
[54] COMPARED: *El. Siglo Medico*. March 9, '07.
[55] CLAYTON: *Dom. Med. Monthly*, June, 1906.
[56] AST: *Müenchen Med. Woch.*, 1892, No. 34.
[57] BAYER: *Münch. Med. Woch.*, June 1, '09.

INDICATIONS FOR CHOLECYSTECTOMY.

1. Malignancy.
2. Hydrops of the gall bladder.
3. Chronic empyema of the gall bladder.
4. Gangrene.
5. When the cystic duct is not patulous.
6. When many small calculi are imbedded in the gall bladder mucosa.—J. B. DEAVER in the *New York State Journal of Medicine.*

A NOTE UPON A METHOD FOR SKIN GRAFTING THE WOUND DEFECT FOLLOWING REMOVAL OF THE BREAST FOR CARCINOMA.

L. G. BOWERS, M.D.,
DAYTON, OHIO.

I have been employing the following method of skin grafting when necessary after the removal of the breast for carcinoma in a number of cases.

After the removal of the breast, the wound is sewed up as far as the skin will permit without producing too great tension. The open space is left as low as possible, i. e., it is kept as far from the axilla as possible, where the skin lies flat to the wound.

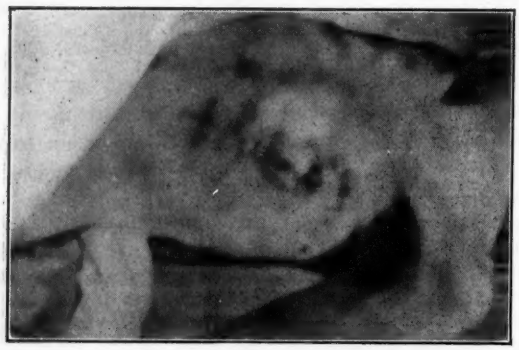

Figure 1.

The necessary skin to fill out the wound is taken from below the umbilicus in the middle line, of the shape and size of the surface to be covered.

The full thickness of the skin, without fat, is removed. (Wolfe graft.) The graft is stitched in place with interrupted sutures.

A dressing of split gutta percha and sterile gauze wrung out of normal salt solution is applied, then a dry, loose dressing of gauze and cotton and a binder. The binder should not be too tight.

The skin wound where the graft is removed is stitched up with a whip stitch. In patients of the cancer age, the abdomen is usually redundant and the skin is loose, therefore the graft can be spared easily and will stitch up without tension. The following precautions should be observed:

The hemorrhage must be perfectly staunched, as oozing and formation of a clot will prevent union. If the skin graft is large it should be punctured at a few points to permit drainage of serum or blood which might collect under it. There should be plenty of dressings applied to prevent too great pressure on the graft, but, on the other hand, there should be gentle pressure to hold the graft flat to wound.

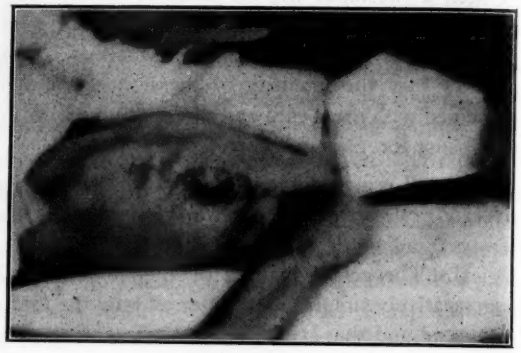

Figure 2.

Occasionally a portion of the surface of the graft will desquamate, but usually enough epithelium is left underneath to rapidly replace it.

AN EASILY MADE INTESTINAL TRACTION FORCEPS.

JOSEPH E. FULD, M.D.,
Assistant Surgeon Gouverneur Hospital,
New York City.

In abdominal operations it frequently becomes necessary to pick up a loop of gut and to make traction on it. To do this Hunter's sponge forceps is unquestionably the best instrument, but as its opposing jaws are smooth the bowel will slip through them unless sufficient pressure is used to injure the gut. To prevent slipping and trauma I submit the device here illustrated, which can easily be made from a Hunter's sponge forceps.

From one side of each ring of the forceps, near

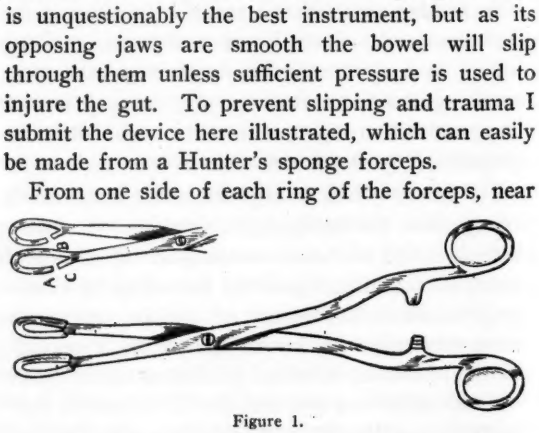

Figure 1.

its base, a section about one-eighth of an inch wide, is removed with a file or saw. Through this opening a piece of small rubber tubing or of No. 15 F. rubber catheter is drawn over the ring from A to B and the free end is slipped over C.

This instrument will also be found useful to hold the appendix, stomach, gall-bladder or Fallopian tube. Moreover, it makes an excellent tongue forceps.

American Journal of Surgery

PUBLISHED BY THE

SURGERY PUBLISHING CO.

J. MacDONALD, Jr., M.D., President and Treasurer

92 William St., N. Y., U. S. A.

to whom all communications intended for the Editor, original articles, books for review, exchanges, business letters and subscriptions should be addressed.

SUBSCRIPTION PRICE, ONE DOLLAR
FOREIGN, SIX SHILLINGS

Original Articles and Clinical Reports are solicited for publication with the understanding that they are contributed exclusively for this journal.

It is of advantage to submit typewritten manuscript; it avoids errors.

CHANGE OF ADDRESS. Subscribers changing their addresses should immediately notify us of their present and past locations. We cannot hold ourselves responsible for non-receipt of the Journal in such cases unless we are thus notified.

ILLUSTRATIONS. Half-tones, line etchings and other illustrations will be furnished by the publishers when photographs or drawings are supplied by the author.

☞SPECIAL NOTICE TO SUBSCRIBERS☜

The "American Journal of Surgery" is never sent to any subscriber except upon a definite written order. Present and prospective readers please note this.

WALTER M. BRICKNER, M.D., Editor

NEW YORK, FEBRUARY, 1913

FRIEDMANN'S CURE FOR TUBERCULOSIS.

Recently tidings have sifted to us through the lay press of the discovery of a new cure for tuberculosis by Dr. Friedmann of Berlin. Confirmation of this report in the medical press is now at hand. The *Berliner Klinische Wochenschrift* of November 18, 1912, contains the original paper as read by Friedmann before the Berliner Medizinischer Gesellschaft; also the verbatim report of the full and lively discussion which followed his address.

Friedmann's short article is merely an outline of his method and results, the complete and detail report is promised for later publication. The short summary, and especially the discussion of the apparently unprejudiced observers who had been privileged to administer the remedy themselves, leave us with the impression that a discovery of profound import has been made. We feel it therefore a distinct duty to outline Friedmann's work to our readers.

Like most investigators who have sought vaccines for bacterial infections, Friedmann came to the conviction that the most potent curative and immunizing powers lie in the living bacterial organism itself, and not in the dead organism as used in the method of Wright and his school. Futhermore it is obvious that such a living vaccine must be avirulent. After many years of observation and experiment, Friedmann finally obtained a stock of tubercle bacilli, which by repeated culture and passage through animals became entirely avirulent for the human organism. Under pressure, Friedmann admitted in the discussion that his bacillus was derived from one of the cold-blooded animals, the turtle.

After demonstrating by injections into animals and even into himself that living vaccines derived from this bacillus were entirely harmless, he began to inject these vaccines into patients afflicted with various forms of tuberculosis. After trying various ways of injection, Friedmann finally concluded that the best results were obtained by what he calls: "Simultaneous injection"—i. e., one dose injected directly into the veins at the elbow, the other intramuscularly. The intravenous injection is not followed by any local manifestation, but the intramuscular injection, *in favorable cases,* is followed by a local induration which slowly disappears. These injections are repeated at intervals of a few weeks, as many as half a dozen being sometimes administered. In advanced cases of tuberculosis, the induration disappears rapidly. Such a rapid disappearance is regarded by Friedmann as an unfavorable omen.

The remedy has now been used by Friedmann and his workers the past year or two in 1,182 cases of pulmonary and surgical tuberculosis. Friedmann offers no statistics, he merely states that after one, two or more injections, all cases of tuberculosis except those far advanced are completely cured. As proof of his claims, he merely contented himself by presenting in the course of his address a number of cured cases, the recital of which is highly impressive. For instance, he reports a case of knee tuberculosis in the advanced stage, with fungous granulations and six deep fistulae, completely healed after two injections. He showed cases of laryngeal tuberculosis completely healed after three injections. He demonstrated various other cases of tuberculosis of the lungs, genito-urinary tract, lymphatic system, eye, skin, etc.; many cured; all favorably influenced.

It is only a short step from cure to immunization, and Friedmann has already started on this problem on an extensive scale. He has thus far vaccinated 335 children, ranging from the newly-born to the age of three years. Most of these children had tuberculous surroundings, and although some of the children were injected over a year ago, in not one has tuberculosis developed.

Manifestly, no definite conclusion can be drawn from this as to the immunizing power of Friedmann's remedy. One thing was surely demonstrated by these observations, both of Friedmann and his co-workers, namely, that the injection of the avirulent living bacilli was entirely harmless.

Friedmann's address is naturally tinged by copious optimism and enthusiasm and affords very little opportunity for a well balanced judgment of his work. That is why we followed the discussion of his paper with perhaps greater interest than his original thesis. The expressions of those who took part in the discussion may be grouped in four classes: first, the enthusiastic; second, praising with reservations; third, mildly critical; fourth, expectantly conservative. It is interesting to note that, with one or two exceptions, those who praised the remedy were those who had actually used it. No one deliberately said that the remedy was of no avail. The largest part of the criticism came from the laboratory workers, such as Citron. These directed their main attacks upon, what to us seems the weakest part of the exposition, the admission by Friedmann that animals immunized by his vaccine did not recover, as was to be expected, although they lived more than twice as long as those that were not immunized. Others criticized Friedmann, some rather bitterly, because he refused to divulge the details of his remedy and his methods. To our mind Friedmann was fully justified in his course. Had he reserved the remedy to his own use the case would be different. He freely gave the remedy, however, to a large number of clinicans in Berlin. We need only think of the possibilities of injudicious preparation and administration by both well-meaning and unprincipled persons to appreciate that Friedmann is perfectly right in keeping the secret to himself until his method is placed on a surer footing. Ehrlich keeps the preparation of Salvarsan a secret, but we have heard of no criticism of his action. At all events, Friedmann promises a detailed publication in the near future.

Our own impression from the entire debate is that Friedmann has enunciated a principle of far-reaching consequence and has probably discovered a remedy that influences tuberculosis favorably. The probability is also very strong that Friedmann claims too much. We confess that to us the tone of Friedmann's remarks, both in his address and in his discussion, was somewhat disappointing in its cock-sureness. He seems to lack the poise and self-criticism of an investigator carrying a large message. We feel sure that his words would carry more weight had he been more temperate. Despite this, his address has impressed us as no medical discovery made in the past year has done.—E. M.

COCCYGODYNIA—WHAT IS IT? COCCYGECTOMY—WHY?

We have inherited from an earlier generation the conception, vaguely applied, of a morbid entity called coccygodynia. Its symptom is pain in the region of the inferior extremity of the spine, it is most common in women—especially "neurotic" women, and it may be due, say the text-books, to "neuralgia, rheumatism or injury to the coccyx." Perhaps true coccygeal neuralgia sometimes exists and deserves the name coccygodynia. But the habit has grown at least common enough to deserve rebuke of attempting to explain by this term a variety of pains in the coccygeal and sacral regions encountered in a variety of conditions. As "coccygodynia" grew into acceptance and expanded in its applications (which was bad enough), there developed from it something worse—the method of treating it by removal of the coccyx.

Injury to the coccyx by a fall is quite generally described as an etiological factor; and, likewise, pain on sitting is ascribed to pressure on the injured coccyx. A woman complains of severe pain in the sacro-coccygeal region, usually radiating, and often, if the physician takes the trouble to inquire, also in the lumbar region, the thighs, the back of the neck or elsewhere. Perhaps the physician is not of the inquiring kind, but he learns that the pain is severe when the patient is seated, and that she has had a fall on her back, more or less related in time with the onset of the pain. He inserts his finger in the rectum and feels the coccyx projecting abruptly forward, fairly movable and painful when pressed upon. He diagnoses coccygodynia from dislocation of the bone by the fall and advises or performs coccygectomy. He forgets that the coccyx normally projects sharply towards the rectum, is fairly movable and gives pain when pressed upon. He overlooks the fact that in the sitting posture the weight of the trunk is upon the tubera ischii and the muscles of the buttocks and thighs—not on the coccyx; and, similarly, he fails to consider that the deep location of the bone also protects it from injury by a fall upon a flat surface.

Obstetric literature records a few authentic cases of dislocation or fracture of the coccyx dur-

ing parturition, and the same accident may result, from the opposite direction, from a kick or a fall astride a rail. If in one of these very rare accidents replacement fails to relieve the pain the surgeon may, indeed, properly consider coccygectomy.

The few women we have seen who had been the victims of this operation for "coccygodynia" were all made worse by it, and in none was the diagnosis justified. Since we have never seen a case that corresponded to our notion of a true coccygodynia we can hardly assert that coccygectomy should not be employed for its relief; but it seems to us that if a real coccygeal neuralgia failed to yield to non-operative treatment it would be more rational to divide the coccygeal nerves than to remove a bone that is a not unimportant part of the perineal support.—W. M. B.

FORTHCOMING ARTICLES.

Beginning with the next issue we shall publish a series of articles on The Diseases of the Bones and Joints by Dr. Leonard Ely, of Denver. These articles are the outcome of painstaking pathological and histological studies, the results of which have led Dr. Ely to certain surgical methods quite different from those generally accepted. The introductory articles will describe the anatomy, physiology and pathology of the joints and bones. The succeeding chapters will deal with the acute arthritides, traumatic and infectious, the chronic joints affections, including tuberculosis, and the acute and chronic diseases of the long bones.

During the year we also plan to publish an interesting series on Military Surgery by Dr. Gustavus Blech of Chicago.

Surgical Suggestions

Repeated attacks of quinsy suggest that the tonsil is diseased. If treatment of the gland does not prevent recurrence of the quinsy, tonsillectomy is indicated.

A peritonsillar abscess can be opened almost painlessly if the line of incision in the mucous membrane, and the tissue beneath, are infiltrated with an anesthetic solution injected with a syringe just as one anesthetizes the skin.

Soreness in the throat is a common complaint of nervous people. Close inspection will often show numerous fine white spots with red areolae—herpes.

For temporary occlusion of a large vessel a soft clamp, compressing fingers or angulation by traction on a tape or silk strand placed beneath are all to be preferred to the application of a ligature, which may damage the vessel wall.

The great number of artificially fed children who die in infancy is appalling and it is due more to improper nourishment than from any other cause. By helping the infant to a point where it can help itself by proper feeding, is within the province of every physician.

An abscess of the scalp and a suppurating occipital lymph gland may present the physical characteristics of an inflamed sebaceous cyst. It is of some importance to make the differential diagnosis since, although incision and drainage are required for all three, removal of the capsule is to be sought in wens and curettage may be required of the gland abscess.

Congenital absence of the appendix is exceedingly rare. Don't pronounce the appendix "absent" without searching behind the caput coli and without splitting the cecal serosa downward from the ileo-cecal junction—the appendix may be completely subserous, even though no thickening is felt. Moreover, the appendix is occasionally intussuscepted into the cecum. Of course, the organ may have been previously removed through some unusual incision, e. g., inguinal or femoral herniotomy.

In preparing the radial artery for transfusion it adds much to the simplicity of the procedure to dissect out the two venal comites en masse with the artery, separating the latter from the former only at the terminal inch (for cuffing). This little variation of the procedure vastly reduces the amount of handling which the artery receives, and provides a means of tying its minute branches at a distance from it, for both of which reasons the production of clotting in the artery by the dissection is obviated.

Surgical Sociology

Ira S. Wile, M.D.
Department Editor

Among existing organizations for the protection of workers The Americann Association for Labor Legislation occupies an important position. It is attempting to work out a constructive program for the elimination of industrial accidents and occupational diseases. While the scope of its work embraces all the fields of industry it sanely proposes well-defined plans for constructive legislation. Inasmuch as accidents are largely dependent upon the hazards in industry, together with ill-advised regulations of conditions and hours of labor, the suggestions for legislative reforms which this organization offers merit consideration.

First on the program is the provision for one day of rest in seven in all industries, no matter how continuous its operations may be. It is obvious that laws making Sunday the day of rest are impracticable and undesirable for the welfare of society. It would be possible, however, to secure greater safety for workers by making it mandatory to allow twenty-four hours rest for each employee during one day of the week. The force of this becomes patent when one realizes that in the steel industry twenty-nine percent. of the employees are ordinarily engaged in work seven days a week. In Massachusetts about seven per cent. of the total population of the state work the entire week. In New York state in sixteen specified industries practically twenty per cent. of the members of the trade unions are engaged in seven-day labor. The influence of a day's rest upon the strength and health of the workers is recognized by hygienists, practical employers and insurance companies. The laws relating to this subject exist in Argentine Republic, Belgium, Denmark, France, Germany, Switzerland, and other countries. Such a scheme would lessen industrial accidents by lessening fatigue and the drain upon the physical resources of workmen.

The second step in the legislative program aims to secure sanitary regulations for the protection of workers exposed to the dangers of lead poisoning. Lead poisoning is practically unnecessary, and by the use of proper safeguards by employers and employees it may be so far eliminated that industrial plumbism shall reduce to almost a negligible number. The exact number of sufferers from lead poisoning is not to be estimated from hospital records, as German statistics have shown that hospital records deal with only about one-quarter of even the severe cases. State sanitary control of industries making use of lead is essential in order to protect our workers.

The third provision of the legislative program demands the extension of uniform methods of reporting industrial accidents and occupational diseases and urges the adoption of standard schedules for such reports. The loss of life and health through accidents and diseases cannot be estimated in the face of a comparative lack ot standard schedules. Professor Seager estimates that annually fifteen thousand widows and forty-five thousand children are forced to live in a precarious manner because of accidents in industries. The education of children is dependent upon the family income and those accidents which lower the earning capacity of the wage-earner impede educational progress. Present legislation is inadequate, as it fails to include all dangerous occupations, nor is there a standard time within which reports must be made. In some states occupational diseases are to be reported by physicians, but insufficient time has elapsed to determine the fullness of reports by them. Hospital statistics are notably lacking in details as to the relation of the industry of the patient to his accident or the disease for which he receives hospial treatment.

Similarly the Association desires to encourage the investigation of industrial accidents and occupational diseases so that state and national authorities, after due study, may advance industrial hygiene and safety.

Other fields of endeavor have to do with the enactment of adequate systems of compensation or insurance against industrial accidents and occupational diseases. The first law relating to this subject was passed in 1902 in Maryland, but was immediately declared unconstitutional. Practically within the last three years the Elective or Compulsory State Insurance Laws were enacted. Fifteen states now have laws dealing with this subject, though only four have gone through the stress of litigation and have been declared constitutional.

Since the United States Supreme Court in 1908 declared the Oregon ten-hour law constitutional, legislative advances have been made in the direction of affording protection for working women. During the past two years Massachusetts and New York have passed laws requiring rest periods for working women at the time of childbirth. The provision under these laws is not strong nor does it fully protect.

Poverty is increased through accidents and occupational diseases. The demonstrable increase in dependent families requires constant increase of hospital and dispensary facilities under private and public control for the purpose of curing the results of our careless disregard for life and limb.

In the line of preventive surgery this type of constructive legislation is of immense moment. To reduce or eliminate the hazards of industry means the conservation of the physical health of workers with a corresponding reduction of the necessity of building up large institutions for the purpose of remedying preventable conditions. This scheme of broad vision and industrial foresight seems to be one solution of the problem of preventing the overcrowding of hospitals, dispensaries, institutions for the blind, the maimed, and the poor. In a wide sense the American

Association for Labor Legislation is undertaking a public health program which is as important to the community as is the anti-tuberculosis campaign or the fight against the hookworm. The medical fraternity should be vitally interested in securing safe conditions of labor in the interests of the public health.

Book Reviews

A System of Surgery. Edited by C. C. Choyce, B.Sc., M.D., F.R.C.S., Dean of, and Teacher of Operative Surgery in, the London School of Clinical Medicine (Post-Graduate); Assistant-Surgeon to the Seamen's Hospital, Greenwich; Surgeon to Out-Patients at the Great Northern Central Hospital. Pathological Editor, J. Martin Beattie, M.A., M.D., C.M., Professor of Pathology and Bacteriology, and Dean of the Faculty of Medicine in the University of Sheffield; Hon. Pathologist to the Royal Infirmary and Royal Hospital. In three octavo volumes of about 1,000 pages each; about 16 colored and 64 black-and-white plates, and 250 text illustrations in each volume. Separate indices. New York: Funk and Wagnalls Co., 1912. Cloth, the Set, $21.00, net.

We have much enjoyed a perusal of volumes 1 and 2, which have thus far appeared, of this excellent work. Although it is composed of individual monographs by about 50 English authors, it is far more acceptable than the usually rather disjointed and uneven "system." It also differs much from the common type of English medical works in that it has gotten away from the insularity that usually characterizes them. Indeed, this system appears English chiefly in its authorship. In text and bibliography it quite recognizes that surgery is a mosaic of international workmanship.

We are pleased also with the prominence given to the pathology of the various diseases considered, and to their differential diagnosis. Operative measures are also referred to and indicated or described, but details of technic are left for works on operative surgery, where they belong. Diseases of the eye are not included.

Volume I deals with surgical pathology and bacteriology and with those subjects generally included under "general surgery." It contains, also, an excellent chapter on x-ray examination, by W. Ironside Bruce, to which the reader may refer for competent information on the radiographic differentiating details of various surgical lesions. There are generous chapters on general, local and spinal anesthesia by J. Blumfeld, Gwynne Williams, and Lawrie McGavin, respectively. Syphilis is considered at length, likewise various tropical surgical infections.

Volume II covers the surgery and surgical pathology of the breast (by W. Sampson Handley); the spleen; face, lips and palate; the tongue; mouth; intestinal tract; peritoneum; rectum and anus; hernia; liver and bile tract; and urogenital systems, male and female.

The typographic arrangement and general make-up of these volumes are very pleasing, and they are supplied with a profusion of excellent original illustrations in black and in colors.

The Surgical Diseases of Children. By William Francis Campbell, A.B., M.D. Professor of Anatomy, Long Island Medical College; Surgeon-in-Chief Trinity Hospital, and Le Grand Kerr, M.D., Attending Pediatrist to the Methodist Episcopal, Williamsburgh, Bushwick and Swedish Hospitals, etc. Octavo; 693 pages; illustrated. New York and London: D. Appleton & Company, 1912.

This book is written by a surgeon and a pediatrist, and by virtue of this collaboration is an especially successful presentation of the surgical diseases affecting children. The medical and the surgical elements are well balanced, so that the book is of as much value to the surgeon from the pediatrist point of view as it is to the pediatrist from the surgical aspect. The aim of the authors has evidently been to present their subject in such a manner as to be of the greatest practical value to the reader. They have evidently succeeded in this aim, since the book is an eminently practical one. This feature of the work is moreover emphasized by the excellent illustrations, which are numerous and very well reproduced. Pictures, such as those in the chapter on Burns and Scalds, showing the correct positions for extremities when involved, cannot fail to bring home the authors' points. The same is true of the pictures illustrating sites for injecting vaccines or of those illustrating the proper method of giving local anesthetics. These various graphic illustrations are admirable.

The first half of the book is taken up with general considerations, such as anesthesia, surgical examination, the operation as such, infectious diseases, injuries, etc. In the section entitled Constitutional Affections with a Surgical Aspect, the authors discuss hemophelia, rickets, scurvy, syphilis and status lymphaticus, thereby more closely welding the medical and surgical aspects of these diseases. The second half of the book deals with regional surgery.

In the section on appendicitis it is gratifying to see that so much stress is laid on rectal examination. A special illustration is here introduced to emphasize this so frequently overlooked procedure.

In a book of this size it is of course impossible to give a full and adequate discussion of each subject, and it seems a pity therefore that a list of additional references has not been appended to each chapter, in order that the reader might refer to other works if necessary. Such references would undoubtedly greatly increase the usefulness of this book

However, we can very highly recommend this volume as an interesting and very useful addition to the library of both the pediatrist and the surgeon.

Nouveau Taité de Chirurgie, Publié sons la Direction de A. Le Dentu et Pierre Delbet. XIV. *Maladies du Rachis et de la Moelle,* par M. Auvray, Professeur à la Faculté de Médecine de Paris et A. Mouchet, chirurgien des Hospitaux de Paris. Large octavo; 528 pages; 211 illustrations; Paris: J. B. Baillière et Fils, 1912.

This large volume contains a wealth of material dealing with our rapidly increasing knowledge of the surgical aspects of the spinal cord and its membranes. It also deals with the diseases of the vertebral column. As most of the symptoms are of nervous nature, physiology and neurology receive extended discussion. Surgical procedures—laminectomy for tumors, fractures, resection of nerves, etc.—are very fully described.

The second half of the volume treats of the diseases of the bone-congenital, inflammatory and static. Much space is devoted to the orthopedic ailments, such as scoliosis and various forms of spondylitis. The German and American literature has been very carefully sifted and quoted—to an unusual degree for a French book.

Nouveau Traité de Chirurgie, Publié sons la Direction de A. Le Dentu et Pierre Delbet. XXVI. *Maladies du Pancréas, de La Rate et du Mesenterè.* Par G. Chavannaz, Professeur à La Faculté, Chirurgien des Hopitaux de Bordeaux, et J. Guyot, Professeur Agrégé à La Faculté, Chirurgien des Hopitaux de Bordeaux. Large octavo; 406 pages; 126 illustrations. Paris: J. B. Baillière et Fils, 1913.

The first 150 pages are devoted to the pancreas. The intestinal and other signs of pancreatic disturbance are considered in detail, especially their study by means of laboratory methods. Next traumatic, inflammatory, cystic and solid neoplastic conditions are described. Finally pancreatic stone and fistulae are discussed.

The next 157 pages deal with the spleen. The still much discussed functions of this organ, and the effects of splenectomy are considered. Injuries of this viscus appear to be increasingly frequent. Hydatid cyst is discussed in great detail and the enlargements due to blood and constitutional diseases are carefully entered into.

The advances in splenic surgery are detailed with many illustrations. The final chapters are devoted to the mesentery. Obliteration of the vessels and tumors comprise the subjects considered.

The subjects dealt with in this volume comprise one of the least known chapters of medicine, and we owe most of the increased knowledge to observations made by surgeons. It is not surprising therefore that each new book contains a wealth of fresh material.

Ophthalmic Surgery. A HANDBOOK OF THE SURGICAL OPERATIONS ON THE EYEBALL AND ITS APPENDAGES AS PRACTISED AT THE CLINIC OF HOFRAT, PROF. FUCHS. By DR. JOSEF MELLER, Privat Docent and First Assistant K. K. II University Eye Clinic, Vienna. *Edited* by DR. WILLIAM M. SWEET, Clinical Professor of Ophthalmology, Jefferson Medical College, etc., etc. *Second Edition*, thoroughly revised. Octavo; 289 pages; 173 illustrations. Philadelphia: P. BLAKISTON'S SON & Co., 1912. Price: $3.50.

An authorized description of the indications for and technic of operations upon diseases of the eyeball as practiced in Fuchs's Clinic must needs be valuable to anyone interested in the subject. And the value of this book is enhanced by the clarity of presentation, the simplicity of the text, and the excellence of the illustrations that truly explain the text. Meller's work, based as it is on the teachings of a great master, is therefore recommended to the English-speaking profession.

Treatment After Operation. By WILLIAM TURNER, M.S., F.R.C.S., Senior Surgeon to the "Dreadnought" Seamen's Hospital, Greenwich, etc., etc., and E. ROCK CARLING, B.S., F.R.C.S., Surgeon to the "Dreadnought" Seamen's Hospital, Greenwich, etc., etc. With a Chapter on the Eye by L. V. CARGILE, F.R.C.S., Senior Ophthalmic Surgeon and Lecturer on Ophthalmology, King's College Hospital, etc., etc. Octavo; 247 pages; 55 illustrations. London: UNIVERSITY OF LONDON PRESS, 1912.

This book has been written to supply a demand that "undoubtedly exists among practitioners for an account of the after-treatment of operation cases." It is not a work for the specialist nor is it one from which the well-informed general practitioner will acquire much information. However, "Treatment After Operation" should prove to be of some value to students of medicine, to young hospital internes and to those beginning the practice of medicine without any hospital experience. The book has been written almost entirely without reference to other books, and the methods of treatment are those employed by the authors. They make no attempt to describe treatments employed by others nor do they indicate differences of opinion. The publishers have made the book attractive in binding and in type.

Skin Grafting For Surgeons and General Practitioners. By LEONARD FREEMAN, B.S., M.A., M.D., Professor of Surgery in the Medical Department of the University of Colorado, Surgeon to the St. Joseph's Hospital, etc., etc. Duodecimo; 139 pages; *24 illustrations*. St. Louis. C. V. MOSBY COMPANY, 1912. Price: $1.50.

This small monograph describes in detail the development of the science of skin-grafting from earliest times to the most recent date. The technic employed in the different methods is described and the indications for the application of the various methods are laid down—somewhat arbitrarily. Skin-periosteum-bone grafting is described all too briefly, even though this type of grafting has a very limited sphere of usefulness. The chapter on the histology and pathology of skin-grafts is concise, readily understood, and includes a review of the epoch-making work of Garré, Thiersch and others; it is perhaps the most interesting chapter in this book for the general practitioner to read, for, despite its title, this book will appeal more strongly to the specialist. For the latter it is a review of the subject to be strongly recommended. The book is well prepared for the reader by both publisher and author; some of the illustrations, however, leave much to be desired.

A Student's Manual of Surgical Diagnosis. By GEORGE EMERSON BREWER, M.D., Professor of Surgery, College of Physicians and Surgeons, Columbia University; Attending Surgeon to the Roosevelt Hospital, New York. New York and London: D. APPLETON AND COMPANY, 1912.

The title of this book of 40 pages is rather misleading, for it is a skeleton-plan upon which the student can build rather than a manual. Brewer's principle in teaching surgery to students is that surgical diagnosis should be made by exclusion and his book is built around this principle. With many others the reviewer believes that this basic principle is a sound one and therefore does not hesitate to recommend Brewer's book to students—the little book presents surgical diagnosis by exclusion simply, clearly and concisely.

Bacteria. By DR. MAX SCHOTTELIUS. Translated by Staff-Surgeon HERBERT GEOGHEGAN, R. N. *Second Edition*. Octavo; 324 pages; 10 colored plates and 33 illustrations. London: HENRY FROWDE and HODDER & STOUGHTON, 1912. Price, $3.50.

In this little book is given an excellent review of the mains facts concerning micro-organisms and the most important diseases caused by them. The subject matter is splendidly arranged and aims to set before the reader a clear conception of the relationship between bacteria and disease. This includes a brief description of the biological characteristics of the bacteria, a review of bacteriologic technic, a discussion of the protective mechanism employed by the infected host, *i. e.*, a review of immunity, and finally a short description of the various most important infectious diseases. This ambitious plan for so small a book, is carried out very well indeed, so that after finishing the book the reader must have a very clear idea of the subject of infectious diseases.

It is a great pity that the English translation is rather poor, especially in the first few chapters, where cumbersome phraseology and direct translations of foreign idioms are so common as to greatly annoy the reader.

Life and Letters of Dr. William Beaumont, including hitherto unpublished data concerning the case of Alexis St. Martin by JESSE MYER, A.B., M.D., Associate in Medicine, Washington University, St. Louis, with an introduction by Sir William Osler, M.D., F.R.S., Professor of Medicine in Oxford University, England. Octavo; 317 pages; 58 illustrations. St. Louis: C. C. MOSBY COMPANY, 1912.

We congratulate Dr. Myer upon the happy thought that impelled him to write the life of one of the pioneers of medicine. Dr. Beaumont's achievements are familiar; of his life, only fragments have hitherto been known. Dr. Myer probably little dreamed when he set out upon this labor of love that he would strike ore of the richest assay; that he would bring to light a history and a personality than which there are few more interesting in the annals of medical biography.

The author went at his task like a sound scholar and has constructed his biography from practically virgin material. He modestly tells of the extent of his labors, which to us appear to have been enormous and infinitely painstaking. Instead of a dearth of data, as Myer at first anticipated, the material placed at his disposal and that which he discovered proved so enormous that an actual sifting became necessary. The nucleus of the material contained in this biography was derived from a chest of books, letters and papers given to him by Dr. Beaumont's aged daughter who still lives in St. Louis. Fortunately, Dr. Beaumont was methodical in his habits and not only kept careful diaries, but preserved every shred of correspondence. In addition to this, Myer derived many interesting data from a wide correspondence with everybody who was in any way connected with Beaumont's activities; from old files of newspapers published in places in which Beaumont lived; from old records in various libraries, and from newly discovered records of the war office between the years 1812 and 1840, preserved in the Surgeon-General's library at Washington. The genealogical data were derived from a study of various New England town

records, some dating back even to 1680. This fact, if nothing else, showed of what metal the author was made.

Of all this, Myer has made a story that is intensely absorbing. It is not only the story of a great man, and of an epoch-making physiological achievement that will stand for all time as a model of careful and honest work, but it also affords us a picture of medical life and practice in the early part of the last century which is as vivid as Boswell's life of Johnson.

Medical history, and especially American annals, has been appreciably enriched by this contribution, and owes Dr. Myer a debt of gratitude.

Diseases of the Eyes. By C. DEVEREUT MARSHALL, F.R.C.S., Surgeon to the Royal London (Moorfield's) Ophthalmic Hospital and Ophthalmic Surgeon to the Victoria Hospital for Children, Chelsea. Octavo; 303 pages; 95 illustrations. London: UNIVERSITY OF LONDON PRESS, 1912.

While not designed for the specialist, this book is sufficiently detailed, especially in the description of operations, to appeal to the specialist. Its purpose, however, is to reach the student of medicine and those practitioners who do a certain amount of eye work and are not as yet experts in the field. The book can reach these two groups, for it is clearly and concisely written, avoids formidable details (of interest to the specialist alone), and presents the individual opinions of an evidently experienced author who possesses a well-balanced view.

Progressive Medicine. A quarterly digest of advances, discoveries and improvements in the medical and surgical sciences. Edited by HOBART AMORY HARE, M.D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College, Philadelphia. Assisted by LEIGHTON F. APPLEMAN, M.D., Instructor in Therapeutics, Jefferson College, Philadelphia. December 1, 1912.

This volume contains the following reviews of the most recent medical literature: Diseases of the Digestive Tract and Allied Organs, the Liver, Pancreas and Peritoneum, by Edward H. Goodman, M.D.; Diseases of the Kidneys, by John Rose Bradford, M.D., F.R.C.; Genito-Urinary Diseases, by Charles W. Bonney, M.D.; Surgery of the Extremities, Shock, Anesthesia, Infections, Fractures and Dislocations, by Joseph C. Bloodgood, and Practical Therapeutic Referendum, by H. R. M. Landis.

New Aspects of Diabetes. Pathology and treatment by PROF. DR. CARL VON NOORDEN, Professor of the First Medical Clinic, Vienna. Lectures delivered at the New York Post-Graduate Medical School, New York. Duodecimo; 160 pages. New York: E. B. TREAT & COMPANY, 1912.

Diabetes is a disease, our understanding of which has notably enlarged within the past decade or two and the management of which has almost been completely revolutionized. In the van of this progress von Noorden maintains a conspicuous place and it is a privilege to obtain a summary of these newer conceptions in a presentable form, from such an authoritative source. Von Noorden discusses his subject under five headings: the source of sugar; the control of sugar formation and its disturbances; the therapy of diabetes and acetonuria. No one who aspires to an up-to-date knowledge of the theory or treatment of diabetes can afford to miss reading this book.

Books Received

Diseases of Women. By THOMAS GEORGE STEVENS, M.D., B. S. (Lord); F.R.C.S. (Eng.); M.R.C.P. (Lord), Obstetric Surgeon, St. Mary's Hospital, Paddington Surgeon (Gynecological), The Hospital for Women, Soho Square, London, etc. Small octavo; 431 pages; 202 illustrations. London: UNIVERSITY OF LONDON PRESS, 1912.

Progress in Surgery

A Résumé of Recent Literature.

Some Observations on Ectopic Gestation With Report of Earliest Recorded Tubal Ovum. SAMUEL W. BANDLER, *American Journal of Obstetrics*, December, 1912.

As a diagnostic measure Bandler found the anterior vaginal incision to expose the vesico-uterine peritoneum of great service. He has employed the procedure in seven out of twenty cases of ectopic gestation in the past year. He prefers to make the T-shaped incision, as it gives a wide exposure. It is not absolutely necessary to enter the peritoneum. In five out of the seven cases there was seen a very distinct blue shimmer to the peritoneum which was identical with the bluish discoloration observed when the peritoneum is exposed by the abdominal route. In favorable cases, that is, where there is no very active bleeding, the operation can be completed per vaginam. The whole procedure takes at most five minutes and there is no danger attaching to the operation.

A report is also given in this article of what is probably the youngest tubal ovum ever observed. It was removed by the abdominal route and was so small that it almost escaped detection. It was found in the isthmical portion of the tube and proved on microscopic examination to be caused by a congenital spur formation and partial duplication of the tube of which one of the compartments ended blindly in the meso-salpinx.

Puerperal Thrombophlebitis. PALMER FINDLEY, *American Journal of Obstetrics*, etc., December, 1912.

The frequency of puerperal thrombophlebitis is estimated at approximately 30 to 35% of all fatal cases of puerperal sepsis. The ovarian veins are most commonly the site of the thrombosis. The symptoms are ushered in by a rigor followed by a rapid elevation of temperature to 104° F.-106° F. and a corresponding increase in pulse rate. The latter continues in spite of a remission in the temperature. The blood culture is not often positive. It is difficult to detect the orangisms in the circulating blood owing to the fact that they invade the blood at intervals.

To one side of the uterus it is often possible to palpate the thrombosed veins, which form an irregular elongated mass running from the uterus to the side of the pelvis. These findings are commonly unilateral. Operation should not be done in the acute stage. The earliest successful case was that of Vineberg which was operated on the fifteenth day of the infection. The operation consists of ligation of one or both spermatic veins with or without hysterectomy. When metastatic abscesses have developed or when pus is present in the pelvis and where there are distinct evidences of lymphatic invasion, the operation should not be undertaken.

A Method of Controlling Post-Partum Hemorrhage by Manual Compression of the Abdominal Aorta: Abdominal Section for Placenta Previa. EDWARD P. DAVIS, *Surgery, Gynecology and Obstetrics*, December, 1912.

Davis was able to save one patient who was exsanguinated through the accidental separation of the placenta, by manual compression of the abdominal aorta. With the hand in the uterus and by means of the closed fist, the aorta was compressed against the spinal column just above the pelvic brim at the bifurcation of the aorta. This maneuvre controlled the bleeding while at the same time stimulation and intravenous infusion were administered. The uterus was then packed with ten per cent iodoform gauze. The patient made an uninterrupted recovery. Davis advises this method in desperate cases of post partum hemorrhage as against the Momberg method of the pressure tourniquet.

Davis regards central placenta previa as a form of ectopic pregnancy and advocates surgical intervention as soon as the condition is recognized. He quotes the literature of central placenta previa treated by Cæsarian section and believes it is life-saving to both mother and child.

Opsonins and Vaccines in Puerperal Sepsis LEON S. MEDALIA, and W. J. WALTON, *Surgery, Gynecology and Obstetrics,* December, 1912.

The study is based on 103 cases. The results are summarized as follows: The opsonic index may be considered of value in determining the resistance of the patient and the possible gravity of the infection when present. But it cannot be said to determine whether a given streptococcus is virulent or avirulent. It is therefore of value from a clinical standpoint only. The actual labor involved in the opsonic test, also the great possibility of error, even in the hands of the most experienced, would rule it out from being applied as a routine test in daily practice. It is of value in research work.

Vaccine treatment, according to this research, is of value in puerperal sepsis and is worthy of further trial in similar cases.

The X-Ray in Gynecology, ROBERT L. DICKINSON, *Surgery, Gynecology and Obstetrics,* November, 1912.

Hysterectomy is no longer warrantable, according to Dickinson, without trial of the ray. The intractable menorrhagias of chronic metritis and all myomas requiring treatment except those infected, degenerating, submucous or polyp, and those suspected of malignancy should be first treated by *x*-ray. The older the patient, the better the response. All fibroids are said to shrink, all hemoglobin percentages to rise. The *x*-ray has a field of usefulness in cases of sexual hyperesthesia, perversion and sexual criminalism. It is most serviceable in women near the age of 40 or over. Chronic metritis in large uteri yields to the ray treatment and certain affections of the uterus or ovaries where menstruation is to be suppressed or where it is desirable to induce sterility.

The technique of foreign authors is described in the article.

Nephrectomy Without Drainage for Tubercular Kidney, WILLIAM J. MAYO, *Surgery, Gynecology and Obstetrics,* November, 1912.

For the last two years Mayo has closed his nephrectomy wounds in cases of tuberculous kidney instead of draining, and later having a persistent tubercular sinus to take care of. In cases where the kidney can be removed without any of the tuberculous material spilling in the wound, complete closure of the wound is made. When some of the tuberculous material has escaped into the wound, Mayo advises pouring as much salt solution into the cavity as will be sufficient to fill it. He claims that this solution is readily absorbed and the wound heals by primary union. The ureter is treated by pouring 10 to 20 drops of (95%) carbolic acid into the lumen. Ureters so treated rarely give trouble.

Studies in the Anatomy of the Kidney. C. W. BONNEY, Philadelphia. *The American Journal of Urology,* December, 1912.

The results of a continual series of autopsy studies of renal anatomy are here reported. Bonney finds that the rôle of the renal fascia in the support of the kidney is an all-important one; no considerable displacement of the kidney is possible unless the integrity of this fascia is more or less impaired. "Imperfect development or acquired relaxation (of this fascia) is the factor principally concerned in the production of floating kidney."

In only 34 of 40 cadavers was the classical relation of renal vein to artery found; the remaining 6 examinations demonstrated that the artery lay in front of the vein in part of or throughout its course. This may have a pathological significance—pressure upon the vein leading to stasis and ultimate structural renal changes—to which attention has not been called.

Accessory superior and inferior polar arteries were found in several instances. Their course from aorta to kidney was generally oblique. The superior polar arteries are of greater surgical significance, inasmuch as they can easily be torn in the delivery of the upper pole of the kidney; even if immediate hemorrhage does not result, rupture of these arteries are a common cause of secondary hemorrhage. The inferior polar artery has been considered of pathological rather than surgical significance (cause of hydronephrosis). The author believes that compression of the ureter by an inferior polar artery is more apt to occur when the artery passes behind the ureter. Whether this artery should be ligated in the effort to relieve a compressed ureter is a debatable question, for it has been demonstrated that there is no anastomosis between the branches of the renal artery. Bonney believes that an infarct may result from this procedure, and therefore suggests the possibility of partial resection of the kidney instead of ligation of the artery.

Fat Hernia. J. RANSOHOFF, Cincinnati. *Lancet-Clinic,* January 4, 1913.

1. A true fat hernia is a protusion of a preperitoneal fat mass or lipoma through one of the ordinary hernial apertures. It follows the course pursued by an ordinary hernia.

2. When a peritoneal process is located within such a hernia, it is always difficult to find, because of its small lumen. Such a process when present (in a minority of our cases) is secondary to the fat hernia and probably results from traction. The ordinary contents of a hernia are not found and can hardly enter into the narrow serous tube within the fat mass.

3. The onset of a fat hernia may be sudden, like that of the ordinary type of hernia with preformed sac. In three of the cases above recorded the history of sudden onset is very clear, and the proportion of cases too large to be charged to inaccuracy of observation on the part of the patient.

4. The diagnosis of fat hernia is far from easy. Although not reducible they are capable of a seeming reduction in a fair proportion of cases.

5. An impulse on coughing can usually be obtained, since the hernia can receive the brunt of the increase of intra-abdominal pressure like an ordinary reducible hernia.

6. In very rare instances symptoms of strangulation may result from torsion of the fat hernia.

7. The treatment of fat hernia differs in no way from that of the ordinary type. It is probable that these cases will only be recognized as fat hernias during the operation, wherefore measures for radical cure will be instituted such as those in vogue for the ordinary forms of hernia.

A Clinical Study of the Elimination of Phenolsulphonephthalein by the Kidneys, with a Report of 150 Cases. H. L. SANFORD. *The Cleveland Medical Journal,* November, 1912.

In a careful study of a large number of cases at the Lakeside Hospital, Sanford comes to the following conclusions regarding the value of the phenolsulphonephthalein test:

In view of a considerable experience in the past with other renal functional tests, we consider the phenolsulphonephthalein test is the most valuable means of estimating kidney functions that has yet been introduced, for the following reasons:

1. The rapid appearance of the drug in the urine after administration; in normal cases in from three to five minutes if given intravenously, and in from five to twelve minutes if given intramuscularly.

2. The complete elimination of the drug by the kidney in a short time. It is only necessary to collect the urine after the appearance of the drug for two periods of one-half hour after intravenous administration, and for two periods of one hour after it is given intramuscularly. All other drugs yet introduced for estimating kidney function appear more slowly and require longer time for elimination.

3. The simplicity of technique of the test. The color of the drug is well adapted for exact colorimetric estimation.

4. The accurate indication of renal power which phthalein gives in cases of prostatic obstruction as an aid in deciding the operability of a case. By successive tests in these patients the surgeon can tell if the preliminary treatment is increasing the functional power of the kidneys, and he thus can select a time when operation would promise the best results. He will equally be warned against bad results.

5. The accurate demonstration of the relative efficiency of each kidney which can be secured in surgical kidney cases by comparison of the phthalein elimination of the two sides with the aid of ureteral catheterization.

Concerning Operations for Hypophysis Tumors. (*Zur Operation der Hypophysis Geschwuelste*). PROF. F. VON EISELBERG, Vienna. *Archiv für Klinische Chirurgie,* Vol. 101, Part I.

In this, the anniversary number of "Langenbeck's Archiv," Professor von Eiselberg, one of the editors, takes as his subject the progress that has been made in the surgery of hypophyseal tumors as an example of the advance that surgery has made in the past decade. Altogether the writer has operated upon 16 cases of hypophysis tumor, the case-reports being given in detail. Most of these patients were females. It is interesting to note that in 8 cases Froelich's type of dyspituitarism (adiposogenital) prevailed and in only 6 instances was hyperpituitarism (acromegaly) present. A combination of hyper- and hypo-pituitarism existed in the remaining two patients.

Disturbances of vision were present in all but one case (in the latter unbearably severe headaches prevailed); the vision was generally affected in the typical way and, objectively, choked disc and temporal hemianopsia were found. Excavation of the sella turcica with more or less destruction was found in the *x*-ray examination of all of von Eiselberg's cases. In several instances there were disturbances in some of the other organs of internal secretion—thyroid, thymus and breasts.

Concerning the operative results, four of the patients died from meningitis, in three instances the direct result of infection from an existing nasal catarrh. Of the remaining 12 cases nearly all showed marked improvement in the relief from headache and in better vision. The most important improvement results from the decompression, the less important (in the author's hands) from the partial removal of tumor tissue. Thus the adipose-genital and the acromegalic symptoms were relieved in some of the cases, but the improvement was never a pronounced one. Microscopically the extirpated portions of tumors showed a comparatively benign structure and this accounts for the fact that recurrent symptoms did not develop in some of von Eiselberg's cases until several years had passed and have not as yet developed in other instances.

The author believes that Cushing's indications for the different types of operations will apply in the future, *i. e.*, subtemporal decompression for the general symptoms of hypophyseal tumor, sellar decompression if the local symptoms prevail, partial hypophysectomy in pronounced and active hyperpituitarism, transplantation of normal hypophysis in selected instances of hypopituitarism. At the present time, however, the indications cannot be so definitely made, owing to the fact that one cannot diagnose, before operation, if the tumor is one of the hypophysis or an inoperable tumor of the base of the brain involving the hypophysis.

All of von Eiselberg's cases were operated upon by a modification of Schloffer's method—by a curved incision the left side of the nose is freed, the nose is turned to the right, the nasal septum is removed and a direct approach to the sella turcica at a depth of some six centimeters is obtained. The author believes that this operation gives the best exposure of the hypophyseal region, yet he acknowledges that Cushing's sublabial approach is a good one and he is further prepared to accept Hirsch's endonasal operation (done 26 times, with excellent results, by Hirsch) if the end-results demonstrate that the ofttimes very limited exposure is not to the patient's disadvantage.

Bone Transplantation as a Treatment of Pott's Disease, Club Feet and Ununited Fractures. FRED H. ALBEE. New York City. *The Post-Graduate,* November, 1912.

Albee gives a further account of the results he has obtained in the orthopedic conditions mentioned above, by means of bone grafts. His method of treating Pott's disease is fully described and his results have been remarkably successful. In brief, his treatment consists in an open operation in which the spinous processes of the diseased vertebrae are exposed. The spinous process of each is next split longitudinally and a greenstick fracture of one of the halves is produced. This results in a wedge-shaped cleft which extends along the spines of all of the diseased vertebrae; and it is into this cleft that a long piece of healthy bone removed from the patient's tibia, is grafted. The graft is fastened by means of sutures and the wound is closed. The after-treatment consists in recumbency on a frame, no plaster jacket being needed, since the new bone acts as a splint. In every case the graft was successful and became firmly united with the surrounding vertebrae so that a marked diminution of the kyphotic deformity resulted. Fifty-two cases have been operated upon, with no mortality. One of the great advantages of the method is the short time required for a seeming cure to be accomplished.

Acid Nitrate of Mercury in Dermatological Surgery. H. H. HAZEN, Washington, D. C. *Washington Medical Annuals,* November, 1912.

This is a brief report of nine cases of superficial new growths treated by acid nitrate of mercury as recommended by Dr. Sherwell of Brooklyn. The treatment consists in local anesthesia by cocaine, then complete removal of the growth by means of curettes or scalpel; hemostasis by cautery if necessary; next application of the nitrate for fifteen to twenty minutes, followed by soda bicarbonate to neutralize the excess. The resulting wound is kept clean and dry, the edema and swelling usually requiring no special treatment. The immediate and permanent results both in benign and malignant growths are excellent and the procedure is highly recommended.

A Unique Case of Intragastric Congenital Malformation Simulating the Clinical Manifestations of Pylorospasm. A. BONNER, New York. *The Post Graduate,* December, 1912.

Bonner describes a very unusual case of an infant in whom the symptoms pointed to pyloric spasm. Bile was present in the vomitus and for this reason pyloric stenosis was excluded. Medical treatment being of no avail, the child was operated upon, a gastro-enterostomy being done. At operation the stomach was found enormously distended. The child died about two weeks later and an autopsy revealed the following unique condition: The mucous membrane in the region of the pylorus was thrown up into a flap-like fold which acted as a valve, allowing fluid to pass freely from the duodenum into the stomach, but completely preventing the passage of fluids in the opposite, *i. e.*, the normal direction.

Non-specific Infections of the Submaxillary Gland. (*Sur les Infections non-specifiques de la Glande Sous-Maxillaire*). G. POTEL AND E. VERHAEGHE, Lisle. *Archives Generales de Chirurgie,* November 25, 1912.

The subject of this paper deals only with the simple infections of the gland—not with tuberculous syphilitic or mycotic lesions. Despite the fact that the buccal cavity is never free from bacteria, the salivary glands are only uncommonly the seat of inflammatory disease. The latter occurs in all periods of life, even in infancy; the tendency to infection is in reverse proportion to the functional activity of the glands. Thus the condition is most common in elderly individuals. A common cause of infection of the gland is the presence of a calculus in the duct. However, any factor that diminishes the flow of saliva favors infection—diabetes, cachexia, nephritis, etc.

Infections of the submaxillary gland occur in adults, however, without any of the above etiological factors at play. Such infections at first sight resemble neoplasms and only occur in the male. This condition was first described by Kuttner in 1896.

Although infections of the submaxillary gland may be well described in two groups, the acute and the chronic, it should be remembered that these are two aspects of one infection. The acute variety may be catarrhal or suppurative. The former is especially met with in old individuals; redness, localized heat, tenderness, accompany the enlargement of the gland. In instances of sialolithiasis salivary colic may, in addition, be present; here attacks of catarrhal inflammation generally occur when the patient is at meals. Suppurative submaxillary inflammation may

be due to calculus or to any of the other causes of infection above mentioned. It is important to remember that, in cachectic conditions, the suppurative affection may go on with exceedingly few local symptoms; in one instance it was not suspected during life and only revealed on the autopsy table.

Chronic infection of the submaxillary gland is most often the sequel to prolonged subacute infection, and then is of a sclerotic type. Pain, difficulty in mastication, a more or less extensively enlarged and painful gland may exist for months at a time. The tumor may become as large as an egg and almost completely immobile. It is then readily confused with a malignant neoplasm.

Whatever the cause of submaxillary inflammation, the prognosis should always be guarded. This is of course especially the case when the acute suppurative variety occurs in post-operative and in cachectic conditions, but it also applies to the catarrhal type occurring in the very old and the very young. The inflammatory tumors run an exceedingly variable course.

The treatment of acute submaxillary inflammation is largely prophylactic—the care of the mouth in the infant, in the post-operative case, in cachectic patients. Attacks of catarrhal inflammation due to calculus are cut short by the removal of the foreign body, but it should be remembered that more than one calculus may be present. Suppuration should be treated by a submaxillary incision; in the presence of an extensive phlegmon the other salivary glands should also be carefully examined for foci. Excision is alone indicated for the chronic inflammatory tumor; this (as in the case reported by the authors) may be very difficult and it may be necessary to leave behind a part of the gland.

Report on Exophthalmic Goiter Based on the Experience of the Members of the Chicago Surgical Society. WILLIAM FULLER, *Surgery, Gynecology and Obstetrics,* November, 1912.

Six hundred cases of exophthalmic goiter operated upon by the members of the Chicago Surgical Society form the basis of this paper. Eighty per cent of the cases were subjected to medical treatment before surgical measures were instituted. Fully eighty-five per cent or more of the cases are cured by operative treatment as regards both thyro-toxicosis and secondary changes in other organs. A few of the cases are not improved by operations either in the toxicity of the disease or in the complications. The immediate average mortality was five per cent.

Surgery is indicated in thyroid enlargements as voiced by the majority of the reports in: (1) Goiter of undue size causing irritating cough, and dysphagia and deformity, and (2) all cases of hyperactivity of the thyroid gland which are not at the same time suffering with acute exacerbations of the disease and in which other less radical measures have shown their inefficiency. The danger line in exophthalmic goiter is represented by the acute and sudden attacks or exacerbations of hyperthyroidism. The various degrees of altered function to be successfully managed may be accomplished by the following measures:

1. Rest, hygiene and suitable medication, persistently employed for a reasonable length of time.
2. Limiting the blood supply to the gland by ligation of one or more of its arteries.
3. Ligation of one or more of the thyroid arteries, with removal of a greater or lesser portion of the thyroid gland.
4. A combination of two or more, or all of these therapeutic aids.

Treatment of Defects of the Phalanges by Transplantation of Pedicled Skin Flaps from the Thoracic Wall (*Uebertragung Gestielter Hautlappen aus der Haut des Vorderen Brustkorbs auf Fingerdefekte*). R SIEVERS, Leipsig. *Deutsche Zeitschrift für Chirurgie,* Parts I and II, December, 1912.

The method in question has been described by Kausch and Kanuski, but has not been in general use. The author has had occasion to employ it in 16 cases in Paye's clinic. The indication is an injury that avulses or otherwise destroys a part of the distal phalanx, leaving a portion or all of the bone intact. Injuries of such types are not uncommon amongst men working in factories. A bridge of skin of appropriate size is raised from the anterior thoracic wall, and the defect in the phalanx is fitted under this bridge and sutured in position. The edges of the incised skin of the chest wall are sutured so that the defect in the phalanx shall not rest against subcutaneous tissues. The arm, forearm and hand are immobilized in plaster of Paris. One week or ten days later the skin-bridge is divided and so sutured that the new finger-tip shall be of approximately normal form. The latter is at first anesthetic, of course, and may undergo a series of trophic changes. In the end, however, the author's results demonstrate that the new finger-tip is of good form, painless and serviceable.

Hemorrhage into the Peritonial Cavity Caused by Accidental Rupture of the Ovary. A. PRIMROSE, Toronto. *The University of Toronto Medical Bulletin,* December, 1912.

Ectopic gestation is so preponderatingly common as the source of intraabdominal hemorrhage in the female that other causes for bleeding are barely, if at all, mentioned in text-books of gynecology. The author believes that accidental rupture of the ovary, generally at the seat of a recent Graafian follicle, is an important, if unusual, source of bleeding. He cites two instances in which the exciting factor seemed to be a severe abdominal strain. In the first case, the patient lifted a heavy weight; in the second instance, violent vomiting seemed the cause. Both patients were operated upon and in both considerable blood was found in the abdominal cavity. Primrose further calls attention to the occasional development of blood-cysts in the ovaries, a condition that is very apt to appear bilaterally; an underlying pathological condition is probably present in these cases.

General Effects and Mode of Action of Artificial Pneumothorax in the Treatment of Pulmonary Tuberculosis (*Effets. Généraut et Mode d'Action du Pneumothorax Artificiel dans le Traitement de la Tuberculose Pulmonaire*). PIERY and BOURDELLES, Lyons. *Paris Médical,* December 21, 1912.

The factors in the minor operation for the establishment of an artificial pneumothorax which play an important rôle are three: 1°. The lung is immobilized and is placed in functional repose. 2°. The diseased lung is composed and an opportunity is given the lung to resume its normal elasticity. At the same time any existing cavities are apt to be collapsed by the induction of artificial pneumothorax and thus tend to heal. 3°. The blood and lymphatic circulation of the collapsed lung are both reduced. This has a directly inhibitive effect upon the pulmonary inflammation.

Conservative Treatment of Tuberculous Glands of the Neck, Based upon Their Pathology. J. L. BROWN, Montclair. *Medical Record,* January 4, 1913.

Brown regards tuberculosis of the glands of the neck as a constitutional rather than a local disease, and believes therefore that general hygienic measures are as important as local treatment. He does not approve of complete extirpation of all the glands by a general dissection, because nature tends to cure in any event, and, moreover, it is impossible to remove every trace of the disease by this means. In most instances, Brown contents himself by merely removing caseous masses with light curettage, disinfecting the cavity with formalin-glycerin and closure of the skin incision. Lately he has been using enzymes of yeast, but he is unwilling to pass definitely upon the benefit derived therefrom.

Pantopon-Scopolamin Injection in Operations under Local Anesthesia (*Uber Pantopon Skopalamininjektionen bei Operationen mit Lokaler Anasthesie.* L. A. DIWAWIN. *Zentralblatt für Chirurgie,* December 21, 1912.

The author has used pantopon and scopolamin in conjunction with local anesthesia in a large number of cases, and is covinced that these drugs enlarge the scope of local anesthesia appreciably. It is contraindicated in chronic alcoholism, diseases of the heart and lungs and in advanced age. The dose of the pantopon-scopolamin must be graded according to the age and robustness of the patient.